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THE WILSON BULLETIN

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DOWITCHER

Limnodromus griseus

Sketch in water color drawn by Peter Rindisbacher, 1829 or earlier. What remains of the original (now 5 x 6½ inches in size) is shown here in its entirety; unfortunately the tip of the Dowitcher's bill was at some time removed by trimming.

Reproduced by courtesy of Dr. Edward P. Alexander, Director of the Wisconsin Historical Society.

THE WILSON BULLETIN

A QUARTERLY MAGAZINE OF ORNITHOLOGY

Published by the Wilson Ornithological Club

Vol. 57 JUNE 1945 No. 2

BIRD PORTRAITS BY PETER RINDISBACHER

BY A. W. SCHORGER

RECENTLY Dr. Edward P. Alexander, Director of the Wisconsin Historical Society, asked me to identify a water color sketch of a bird by Peter Rindisbacher. The drawing, in the possession of the Society, is now reproduced for the first time (Plate 8). Careful examination of the portrait has convinced me that it represents a Dowitcher (*Limnodromus griseus*) although it is lighter than any individual I have seen of that species and has interesting points of resemblance with Wilson's Snipe (*Capella delicata*). For example, the pose of the pictured bird, unlike any pose I have observed in the Dowitcher, is very characteristic of Wilson's Snipe when suspicious or belligerent. Further, the original drawing shows on the back of the bird dark brown markings characteristic of the Snipe but lacking in all the Dowitcher specimens I have so far examined. However, other characters, particularly the absence of the white edge on the outermost primary (which is so noticeable in Wilson's Snipe), seem to bear out the identification of the bird as a Dowitcher.

On the front of the drawing is written in an unknown hand, "Pattashgas of the Wisconsin"; on the back appears in German script, "Padaschgaas," followed by "Chippeway." The German script is evidently in the artist's hand.

Recorders of the Indian languages spelled the words phonetically so that literal agreement between authors is not to be expected. Cooke [1] does not include Dowitcher in his list of bird names; he gives *pa-dash'-ka-an'-ja* as the name of Wilson's Snipe in the Chippewa tongue, and *kitchipadashkaanja*, "big snipe," as the name of the Woodcock, Bishop Baraga [2] gives: snipe, *padashkaanji;* woodcock, *padashkaaaji;* curlew, *patashkanje*. He also omits the Dowitcher.

What is known of the life and works of Rindisbacher is due largely to Grace Lee Nute.[3] He was born in 1806 in Upper Emmenthal, Canton of Berne, Switzerland. In 1821, the Rindisbachers emigrated to America, landed at York Factory, Hudson Bay, and after a gruelling trip arrived at Lord Selkirk's colony at Pembina on the lower Red River. Discouraged by the great flood of 1826, they started southward, arriving at Fever River, Jo Daviess County, Illinois, in November of

that year. The following spring they moved to the lead region of southwestern Wisconsin, where they remained about three years. Peter Rindisbacher then went to Saint Louis, where he died on August 13, 1834, aged 28 years. The death notice described him as a miniature and landscape painter. Prior to 1829, when Rindisbacher went to Saint Louis, most of his drawings related to Indians and their activities.

Some history of the sketch reproduced here has been given by Alice Smith.[4] She reports that while Lyman C. Draper was superintendent of the Wisconsin Historical Society, he broadcast a request for paintings and other contributions; on July 25, 1854, Caleb Atwater of Circleville, Ohio, wrote Draper that he was sending "4 drawings of my favorites, natives of your region of the country." Among them was the "Pattashgas of the Wisconsin." Atwater had attended the Treaty at Prairie du Chien, Wisconsin, in 1829.[5] While there he acquired these drawings, among others, from Rindisbacher. Miss Smith informs me that Atwater, on starting back to Ohio in his wagon, took the artist part way to Saint Louis.

Three pictures by Rindisbacher which are of interest to ornithologists appeared in the *American Turf Register and Sporting Magazine:*

"Grouse." Vol. 3 (1832):589;

"Wilson's Pinnated Grouse." Vol. 4 (1833):605;

"Wild Turkey Trap." Vol. 5 (1834): 108.

The "Grouse" is the Prairie Sharp-tailed Grouse, *Pedioecetes phasianellus campestris,* the second illustration of *campestris* to appear, it having been preceded by that of Bonaparte in 1828; the "Wilson's Pinnated Grouse" is the Greater Prairie Chicken, *Tympanuchus cupido pinnatus.*

The determination of the locality in which the drawings were made was an interesting problem. The text accompanying the "Grouse" lithograph is signed "R." It might be possible to obtain further information on the author by examination of the early volumes of the magazine, but these were not available to me. "R" states that the drawing was sent to the editor by Mr. Rindisbacher. The text accompanying the "Wilson's Pinnated Grouse" is not signed; since it did not contain any new information on the grouse, it was probably prepared by the editor. The introductory sentence reads: "For the drawing of the 'Pinnated Grouse,'. . . . we are indebted . . . . to Major Mason and Lieut. Holmes, of the army of the United States; at whose instance Mr. Rindisbacher had the kindness to make the sketch for the American Turf Register and Sporting Magazine." Capt. Richard B. Mason was with the 1st Infantry and was stationed in Louisiana in 1828, when he was transferred to Fort Crawford, Prairie du Chien, and he was at this station in 1833 when he was promoted to Major of Dragoons. Lt. Reuben Holmes[6] was stationed at Jefferson Barracks, Saint Louis, for most of the period between April 1827 and early 1832. Both officers participated in the Black Hawk War in 1832.[7] It seems altogether probable

that Major Mason had met Rindisbacher after coming to Prairie du Chien, while Lieutenant Holmes knew him at Saint Louis and induced him to publish the drawing of the Sharp-tailed Grouse. Since it is very unlikely that specimens of this bird would be available in Saint Louis, it is probable that the sketch of the Sharp-tail (as well as that of the Prairie Chicken) was made in southwestern Wisconsin prior to Rindisbacher's departure.

In a recently published paper [8] on the early history of these two species of grouse in Wisconsin, I established the southern limit of the Sharp-tailed Grouse at Chicago (lat. 42°N) and the northern limit of the Prairie Chicken at Green Bay, Wisconsin (lat. 44° 30'N). "R" states that the Sharp-tail "is not seen below the 42° of north latitude," that the Prairie Chicken ranges below 42°; and that "between 42° and 43°, is common ground." He may have been living at Prairie du Chien (lat. 43°), in which case he would have observed no Prairie Chickens for some distance northward since the terrain was entirely unsuitable for them. "R" very evidently resided in the "common ground," for he mentions seeing a large mixed pack of the two species between latitude 42° and 43°; and says that if possible, the following fall, he would send the editor live specimens of the two species so that he could determine whether they could be crossed.

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2. Bishop [Friedrich] Baraga. A dictionary of the Otchipwe language. Montreal (1878).
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4. Alice Smith. Peter Rindisbacher: A Communication. *Minn. Hist.* 20 (1939): 173–175, 2 pls.
5. Caleb Atwater. Remarks made on a tour to Prairie du Chien; thence to Washington City, in 1829. Columbus (1831):3.
6. *Wis. Hist. Soc. Coll.* 12 (1892):257, 287–288. [R. G. Thwaites, the editor of this volume, is in error (p. 287, note 4) in identifying the "Lieut. Holmes", mentioned in the published letter, as Theophilus H. Holmes, who was in the South and Southwest during the entire period under consideration.—See Gen. G. W. Cullum. Biographical register of the officers and graduates of the U.S. Military Academy. Boston (1891). vol. 1, p. 446.]
7. Frank E. Stevens. The Black Hawk War. Chicago (1903):120, 189, 204, 225.
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TRANS-GULF SPRING MIGRATION OF BIRDS AND THE COASTAL HIATUS *

BY GEORGE H. LOWERY, JR.

FORTY years ago Wells W. Cooke suggested that many birds which migrate across the Gulf of Mexico in spring do not stop on reaching the coast of the United States but instead fly some distance inland before alighting. Notwithstanding the importance of Cooke's brief but pointed statements (1904:13, and 1915:33), surprisingly little attention has been given the matter by subsequent writers. Cooke's original postulation was based on meager evidence supplied by a few scattered field observers; his later comments were apparently prompted by the knowledge that two competent ornithologists had spent an entire spring on the northwestern coast of Florida without finding a single example of many regular trans-Gulf migrants such as the Yellow-breasted Chat, Redstart, and Indigo Bunting. Since abundant data from the lower Misssissippi River valley and from along the Gulf coast of the United States are now available for analysis, Cooke's postulate may well be re-examined.

To the many ornithologists who study migration of species that use the trans-Gulf flyway, and to those who think of the Mississippi delta as the region where myriads of weary transients immediately alight upon sight of land, the following statement may come as a surprise: During clear weather, trans-Gulf spring migrants that do not breed on the Gulf coast or in the lower Mississippi River valley proceed inland several hundred miles before coming down. That stretch of coast which one might suppose to be teeming day after day during the spring with multitudes of migrants which have just completed the over-water passage from Yucatan or Campeche is, in actuality, *during fine weather*, an "ornithological vacuum" so far as many migrants are concerned. Many species of common trans-Gulf migrants are rare or absent at certain coastal stations throughout an entire spring migration period. *During inclement weather*, however, all trans-Gulf migrants are precipitated on the first available land, and this results in enormous concentrations of migrants on wooded coastal islands and cheniers.[1] When the weather clears, most migrants immediately resume their northward flight.

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* Since some readers may be surprised that Mr. Lowery makes no reference here to George G. Williams' very stimulating article on trans-Gulf migration that appeared in the January 1945 *Auk*, it seems desirable to explain that the present paper was submitted to the *Bulletin* in May 1944, and technical difficulties have delayed its publication until now. It is interesting to compare the data presented by Williams with that assembled by Lowery and to note their very different conclusions.

Mr. Lowery now informs me that he made in May of this year a very interesting trip on a slow boat to Progreso, Yucatan, and gathered important additional evidence of trans-Gulf migration. This, with new migration data collected along the coast, on the Gulf, and in Yucatan, by boat crews and others he has interested in the problem, will be included in a report he is now preparing for the press.—Ed.

Some writers have gone so far as to assert that the state of the weather at any point has little, if anything, to do with the arrival of migrating birds, and the belief of observers who have thought that they could foretell the appearance of various species by a study of weather conditions has received little or no support. Nevertheless, the state of the weather in the lower Mississippi valley and along the Gulf coast is of tremendous importance in determining the arrival of migratory species at any given place in those areas, and will, therefore, be given detailed consideration in the present discussion.

Effects of Polar Fronts

Inclement weather on the northern Gulf coast in the spring most frequently results from the movement of cold polar air-masses down from the north or northwest and their subsequent contact with warm air that is approaching from the south. Advances of such cold air masses are usually described in Louisiana as "northers" or "northwesters." Along the forward edge (the polar front), the warm and humid air is

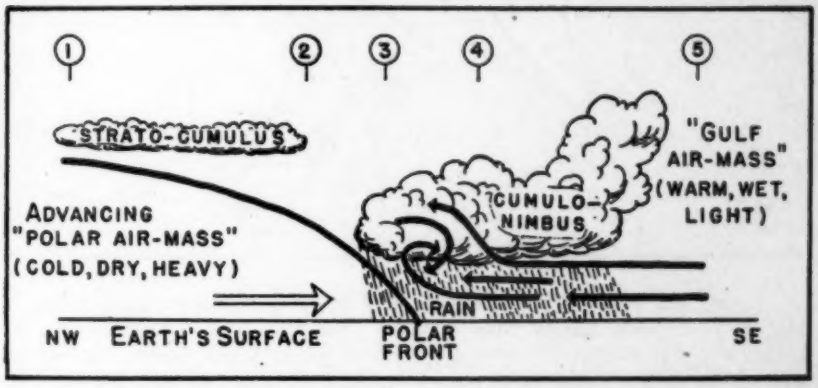

Figure 1. Idealized vertical section in atmosphere showing conditions associated with an advancing polar front. The scale varies with individual fronts; the above might represent a distance of 100 miles horizontally and 10 miles vertically. The rate of advance varies from 5, or 10, to 60 miles per hour. Point 1 lies in polar air; light to medium northerly or northwesterly winds and dry air are typical here. Point 5 lies in warm, humid Gulf air. Point 4 has heavy cloud cover, precipitation, and violent, gusty winds. Electrical storms are typical along this "squall line." Higher and thinner clouds, with less precipitation, characterize Points 2 and 3. At Point 2 there may be only a high cirrus haze.

forced to rise as a result of being under-run by an increasingly thick wedge of cold air. Under the decreased pressure at higher levels the warm air expands and cools. Condensation and precipitation result. At

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[1] In coastal Louisiana a *chenier* is a wooded ridge running through the low marshes parallel to the Gulf.

the edge of the cold front the forced ascent of warm, moist air is violent and intermittent, and is accompanied by squally winds, not infrequently by rather severe twisters. The clouds are of the cumulo-nimbus type (Rossby, 1941:634).

What happens when birds crossing the Gulf of Mexico through the warm air-masses lying over the whole Gulf-Caribbean region encounter the forward edge of air masses descending from the north (see Figures 1 and 2), with the accompanying headwinds, squalls, and generally

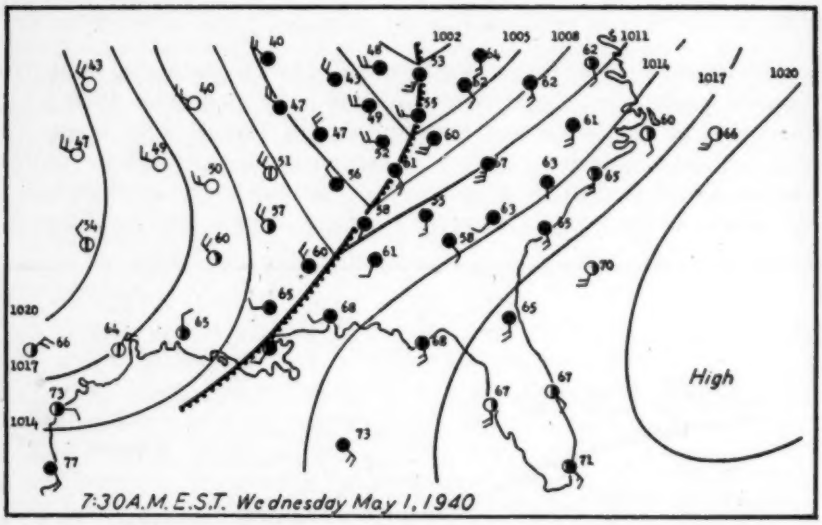
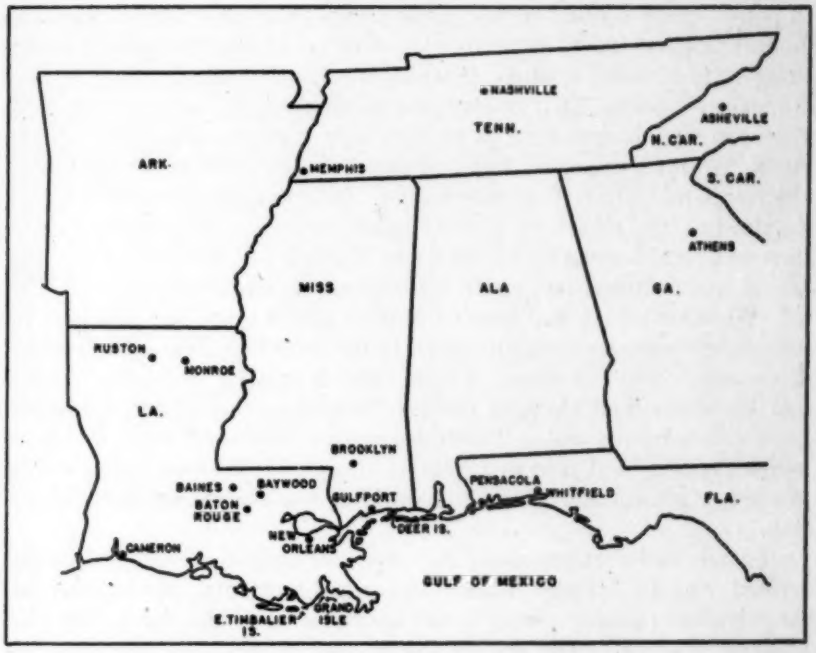


Figure 2. Position of a polar-front wave over the southern United States on May 1, 1940 (from Rossby, after Haynes). The cold front is indicated by the barbed line; the warm front (over the northern states) is not shown. The eastern part of the country lies in warm, humid air, the western part in cold, dry air. This may be seen by the temperatures (in °F.) at each station. The direction toward which the wind is blowing is shown by the arrows pointing to the circles representing the stations. Wind velocity is indicated by the cross-bars on the arrows, one full bar denoting approximately 5 miles per hour. The degree of cloudiness is indicated by the extent to which the station ring is filled with black. Figures on solid lines show pressure in millibars.

stormy conditions, will be discussed in detail later, but it is obvious that when the polar front extends southward beyond the northern edge of the Gulf, migrants must turn back to Yucatan or try to reach the land ahead, either by flying through the storm or by ascending above it. To fly above the storm would be possible for only a short distance. The height of a cold front, even comparatively near its forward edge, doubtless exceeds the upper flight limit of most (if not of all) migrants. That migrants would under any circumstances retreat to the point of their departure, especially after having covered more than half the dis-

tance across the Gulf, is supported neither by evidence nor by logic. Various observations show that when migrants reach the "squall area" just ahead of the polar front they drop close to the surface of the Gulf, possibly in an attempt to escape the buffeting effects of higher wind currents, and then exert their full energies toward beating their way through the headwinds and squalls to the shelter of land.

Frazar (1881) describes the efforts of many small birds to reach shore against a severe "norther" on the afternoon of April 22, 1881,[2] 30 miles off the coast of Louisiana. On numerous occasions I have witnessed similar phenomena. On April 7, 1937, I found almost no migrants on Grand Isle, Louisiana, a small narrow island 40 miles west of the mouth of the Mississippi River (Figures 3 and 4, Map 1). On April



Map 1. The northern Gulf coast.

8 a strong "norther" developed. At 2:00 P.M. we stood on the front beach and observed several small flocks of Purple Martins (*Progne subis*) and Eastern Kingbirds (*Tyrannus tyrannus*) appear from over the Gulf flying very low. These birds immediately settled in the trees

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[2] Frazar's article gives the date as April 2, but this may have been a typographical error. Cooke (1904:25) refers to the same observation under the date April 22, probably from notes furnished him directly by Frazar. Certain birds mentioned by Frazar are definitely the kinds which he might have encountered late in April and not ones which appear so early as the first part of that month.

just behind the front beach. Later in the afternoon we saw a larger bird approach the island and followed it with binoculars until it came to rest within a short distance of us on the beach. We identified it as a Green Heron (*Butorides virescens*). The bird was obviously fatigued and we nearly succeeded in catching it before it struggled ahead of us a few feet to the safety of the near-by trees. All during the afternoon of April 8, birds continued to appear in great numbers in the trees on the island. The morning of April 9 was particularly notable for the great abundance of Cerulean Warblers (*Dendroica cerulea*), which are rather rare spring transients on the Louisiana Gulf coast. The trees were literally filled with this and other species of birds.

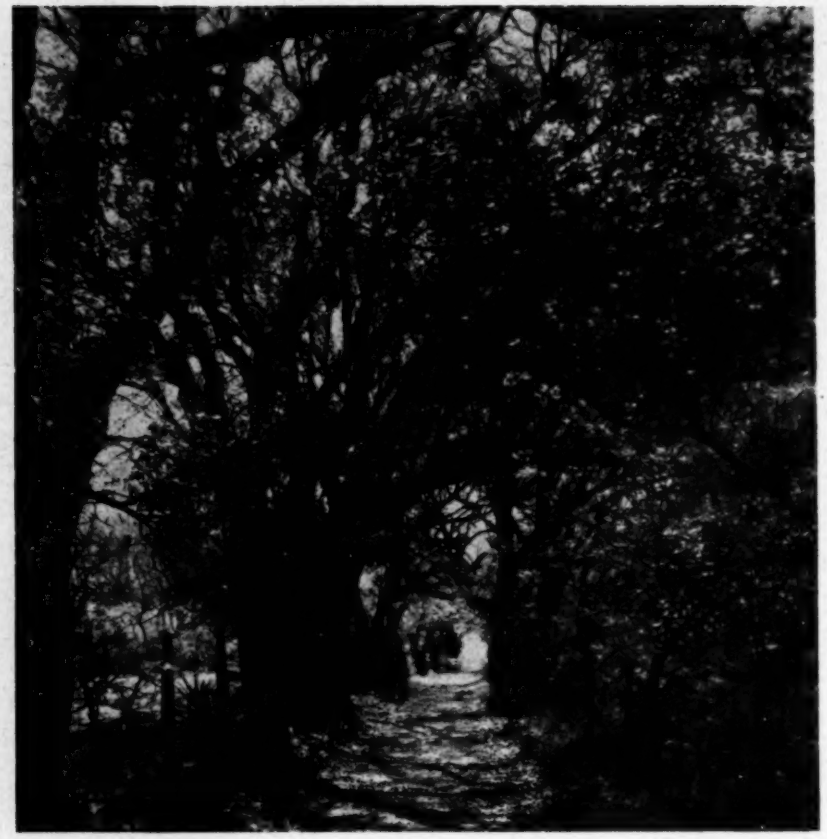
Incoming migrants that are attempting to reach land in the face of a storm are not always fortunate enough to make contact with the coast at points where wooded areas provide refuge from the wind and rain. In Louisiana, particularly, there are vast stretches of coastal marshes, sometimes 40 to 50 miles in depth, in which transients would find little shelter from the elements. That storm-battered migrants do, nevertheless, take refuge in such barren areas is evident from numerous observations. In April, 1940, for example, I had planned to cross Timbalier Bay from the mainland to East Timbalier Island. But my companions and I were detained at the mouth of a small canal emptying into the Bay by a "norther" which came up on the night of April 11. Because of the high winds, our boat was tied up on the edge of the marsh throughout April 12. We went ashore and found the short marsh grass and low-growing mangrove bushes teeming with small birds, notably Acadian Flycatchers, Red-eyed Vireos, Cerulean, Yellow, and Kentucky Warblers, American Redstarts, and Orchard Orioles (*Empidonax virescens, Vireo olivaceus, Dendroica cerulea, Dendroica aestiva, Oporornis formosus, Setophaga ruticilla,* and *Icterus spurius*). They were feeding energetically in the low growth and apparently working in a general northerly direction.

Islands and cheniers along the coast, on occasions such as just described, may be literally flooded with small migrants. No printed description can possibly convey a full appreciation of the sight. The bird observer is often bewildered by the number of birds on mornings following the advent of a "norther." On several occasions, Grand Isle, Louisiana, has been the refuge of such great hordes of incoming migrants that practically every bush on the island contained birds. Warblers have been observed perching on the porches of houses and fluttering in numbers through open windows; they have presented such concentrations that an observer could stand in one spot and count a hundred or more small birds close at hand.

Thomas D. Burleigh (*in litt.*) describes a similar observation made on Deer Island, on the coast of Mississippi, on April 26, 1940. He noted 20 species of warblers alone, and the number of individuals of all migrant species ran into the thousands. This was preceded and accom-

Fonville Winans

Figure 3. Aerial view of Grand Isle, Louisiana. In the foreground, the Gulf of Mexico; in the background, Barataria Bay. The island is about nine miles in length, but only the central part is covered with vegetation as shown here.



Fonville Winans

Figure 4. Close-up of vegetation on Grand Isle, taken near the center of the area shown in Figure 3. It is isolated areas of shelter such as this that frequently serve as refuges to swarms of migrants arriving on the northern Gulf coast during adverse weather.

panied by the advance of a polar front that extended over part of the Gulf of Mexico. (See Table 5.)

Many incidents similar to those just described, illustrating the kind of weather prerequisite to the appearance of great waves of trans-Gulf migrants in Gulf coast regions, could be drawn from my notes and those of other recent observers.

Departure of Birds Following Polar-front Storms

The weather immediately following polar-front storms in the Gulf coast region is usually characterized by clearing skies and rising temperatures. Winds generally shift back to the south or southeast a few days after the arrival of a cold front.

Contrary to opinions expressed by some writers, migrants which arrive on the Gulf coast are not so completely fatigued as to require long periods of rest before advancing northward. Flocks of migrants which seem to remain in one locality for several days probably represent several successive waves. Burleigh, at Gulfport, Mississippi, and Weston, at Pensacola, Florida, concur (*in litt.*) in the assertion that as the weather clears following a "norther" the swarms of migrants immediately begin to disappear. Should the weather clear on the morning following the passage of a polar front, the concentrations are usually maintained throughout the first day. On the second day, however, only a few are found, and even those may be individuals composing the rear-guard of the initial flight which did not reach shore until sometime during the preceding day.

Of course many observations support these statements and analyses but the events of March 27-29, 1942 are especially typical and conclusive. Thomas R. Howell and I reached Grand Isle, Louisiana, in the late afternoon of March 27. The wind was out of the north, and the sky was heavily overcast. Although the western end of the island consists chiefly of sand dunes, marshes, and mud flats, one of the several small birds we found feeding on the treeless sand dunes by the side of the road was a Yellow-throated Warbler (*Dendroica dominica*). An arboreal species such as this feeding among sand dunes or other treeless places is a characteristic occurrence when migrants are forced by the weather to descend on the first available land.

We made a brief survey of the wooded section of the island before nightfall. Trees and bushes were filled with birds. The wind grew stronger near midnight. Early on the morning of March 28 we began a systematic inspection of the bird life in a stretch of live oaks about three-quarters of a mile long and 200 yards wide. The number of birds present was incalculable. Throughout the day we worked slowly back and forth through this woodland. There was an amazing number of small migrants; standing in any one spot, we could easily count several hundred birds within view. The predominant species were the White-eyed Vireo and the Black and White, Prothonotary, Parula, and Hooded

Warblers. The earliest Louisiana arrival dates for four species—Cerulean and Blackburnian Warblers (*Dendroica fusca*), Oven-bird (*Seiurus aurocapillus*), and Redstart—were established on March 27 or 28, a point which will serve to illustrate subsequent discussions under the heading of "Average Arrival Dates."

The weather cleared completely on March 28, and the temperature rose rapidly throughout the day. On March 29, after a completely clear night with moderate easterly winds, only a few birds could be found, proving beyond any question that most of them had resumed their flight during the first night following the abatement of the storm. (See Tables 1 and 6.)

TABLE 1

COMPARISON IN NUMBER OF INDIVIDUALS OF CERTAIN MIGRANTS SEEN AT GRAND ISLE, LOUISIANA, ON TWO SUCCESSIVE DATES

	March 28	March 29
White-eyed Vireo, *Vireo griseus*	100	6
Yellow-throated Vireo, *Vireo flavifrons*	10	3
Black and White Warbler, *Mniotilta varia*	300	30
Prothonotary Warbler, *Protonotaria citrea*	300	30
Parula Warbler, *Compsothlypis americana*	300	30
Yellow-throated Warbler, *Dendroica dominica*	25	0
Louisiana Water-thrush, *Seiurus motacilla*	8	1
Kentucky Warbler, *Oporornis formosus*	25	3
Hooded Warbler, *Wilsonia citrina*	200	35

Francis M. Weston, in a recent letter to me, stated: "You may be interested in an observation that extends your statement . . . about the resumption of northward flight after a period of bad weather. I have seen on at least two occasions the behavior of swarms of delayed migrants on the last day of their enforced stop-over. Each time the weather was clear and mild, with no wind. Toward sunset, the birds congregated in the tops of the tallest trees, where the last rays of the sun made them very conspicuous. I have never seen so many Summer Tanagers and Orchard Orioles as on these two occasions. From the tops of the trees, small groups occasionally made short flights upward, returning to the trees. They continued to do this as long as the light lasted and I could see them and, presumably, they continued to do this even after dark until the electric moment for departure arrived, for in the morning they were gone and the woods were deserted."

Burleigh, who has made observations on the Mississippi coastal islands over a period of eight years, informs me (*in litt.*) that his experiences have been similar. That is, when the weather clears following the passage of a polar front, migrants immediately begin to disappear from the coastal areas, indicating resumption of northward flight. Transient

migrants remain on the coast only so long as disturbed weather conditions and strong north winds continue.[8]

The correlation between local weather conditions and the appearance of trans-Gulf migrants has so far been considered only for the times when polar fronts extend to or even beyond the Gulf coast. Often the polar air masses do not reach the Gulf before losing their forward momentum. The weather along the coast may be highly inclement with overcast skies and fresh winds, but when the winds do not shift to the north or northwest, there is but slight precipitation of trans-Gulf migrants in coastal areas. In other words, most of the birds pass over the coastal region and are precipitated when the actual front is reached.

An analysis of a specific set of observations might serve to illustrate the point in question. George M. Sutton, James H. Bruns, and I arrived on the coast of Cameron Parish in the late afternoon of April 21, 1942. We spent the following week in studying the bird life of the region, particularly that found on the island-like oak ridges or cheniers paralleling the coast. The weather conditions during the period were for the most part unsettled with occasional rains, but at no time did a "norther" develop. There were practically no migrants, except for the small number present on our arrival. Inquiry among residents at the time, and a check later with Weather Bureau reports, indicated that we had arrived too late. A "norther" had developed a few days prior to our arrival; hence, the migrants present during the initial part of the period of observation were a carry-over.

Although the unsettled weather continued, no new cold fronts developed. Fresh winds blew out of the south, southeast, and east, but never from the north or northwest. Notwithstanding our location in the path of trans-Gulf migration at the height of the migration period, we found only negligible numbers of trans-Gulf migrants. It must follow that they were passing over the coast at that point. Several times during the day of April 27, the low-flying clouds broke overhead, and clear, blue sky was visible beyond. Since the unfavorable weather phenomena were occurring especially close to the earth's surface, there is not much doubt that the birds were flying above the adverse forces. Actually, weather conditions at those heights might even expedite northward flight. But as already stated, the distance that the birds could progress northward above the adverse weather conditions would depend on where the height of the squall area or the actual polar front exceeded that to which birds could ascend. When that threshold was reached, the birds would be forced to descend. Since successive waves of migrants would be precipitated in the same general area, a tremendous concentration of migrants would result there.

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[8] The Veery (*Hylocichla fuscescens*) and the Olive-backed and Gray-cheeked Thrushes (*H. ustulata* and *H. minima*) do sometimes linger longer than other birds because of the attraction afforded by the fruit of the red mulberry (*Morus rubra*) of which they are very fond and which is very prevalent in the coastal plain region.

If we had any method of determining the altitudinal limits to which birds might ascend before being forced to face the vicissitudes of the inclement weather below, we might, by study of weather charts plotting the movements of air masses, actually predict the areas where great concentrations of migrants could be expected in the lower Mississippi valley.

The Baton Rouge Region

I first became aware of phenomena that suggested an extensive coastal hiatus before reading Cooke's brief remarks on the subject. I had spent several years observing bird migration in extreme northern Louisiana, at Monroe and Ruston. Since 1932, when I established residence at Baton Rouge, in south-central Louisiana, I have had the opportunity to make observations both there and in extreme southern Louisiana and to compare the patterns of spring migration on the coast, in northern Louisiana, and at Baton Rouge.

The Baton Rouge region is probably one of the best worked areas in the South if the number of field observers, the amount of time spent in the field, the large number of extralimital species collected, and the total number of species and subspecies recorded are accepted as criteria for evaluating the intensity with which a given area has been worked.

Baton Rouge is located on the banks of the Mississippi River almost directly in line with the center of the trans-Gulf flyway. In one direction the coast lies less than 70 miles away. The physiography of the country surrounding Baton Rouge is extremely diversified and should be attractive to birds. North of Baton Rouge are hills cut deep by ravines and forested with dense stands of mixed hardwoods, including holly, beech, magnolia, and several kinds of oaks; to the west, across the river, lies the extensive Atchafalaya River swamp with hundreds of square miles of mixed bottomland hardwoods and cypress; to the east, stretch equally large expanses of long-leaf, loblolly, and slash pines; and below the University, the battures [4] of the Mississippi River are lined with cottonwood, willow, red gum, and sycamore.

Yet in spite of the location and apparent physical attractiveness of the Baton Rouge environs, and in spite of the thoroughness with which the area is worked, most of the trans-Gulf migrants that do not breed on the Gulf coast or in the lower Mississippi valley have been recorded rarely or not at all in the Baton Rouge region during the spring (see Table 2). The comparatively few records for those species which have actually been noted at least once in the Baton Rouge area are in virtually every case directly attributable to prolonged periods of inclement weather which caused an accumulation of migrants in the coastal region.

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[4] A *batture*, in current usage, is the area between the levee and the channel of the stream. Originally, before the building of the levees, the term was used to designate the high ground next to the channel. Sometimes considerable land lies between the levee and the river, especially where the levee does not follow the meanders of the river channel.

Observations recorded on April 30 and May 1-3, 1940, are notably significant in this connection. (See Table 5.) The latter part of April was decidedly unsettled throughout most of the central Gulf coast region. Burleigh (*in litt.*) recorded a great wave of migrants on the Mississippi coast on April 26. It was stormy at Baton Rouge on the night of April 29, and 2.44 inches of rain fell. The weather on April 30 was very unsettled, and we obtained the first Baton Rouge spring record for the Chestnut-sided Warbler. May 1 (see Figure 2) was cloudy in the forenoon with light rains, but the skies had cleared by 11:30 A.M. The woodlands 15 miles north of Baton Rouge were filled with migrants. The Golden-winged, Blackburnian, and Canada Warblers were each recorded in the vicinity of Baton Rouge for the first time in the spring. Second spring records were obtained for the Black-billed Cuckoo and for the Black-throated Green Warbler (Table 2). To ornithologists who know these species as abundant spring migrants in the Mississippi valley, their rarity at Baton Rouge must appear inconceivable.

Observations in the spring of 1943 are also illustrative of the rarity of transient migrants at Baton Rouge. My associates and I were in the field 42 of the 47 days between March 20 and May 7. A. W. Burdick,

TABLE 2

SPRING STATUS AT BATON ROUGE OF CERTAIN TRANS-GULF MIGRANTS 1933–1943

	Number of Records[a]
Black-billed Cuckoo, *Coccyzus erythropthalmus*	3
Alder Flycatcher, *Empidonax traillii*	None
Least Flycatcher, *Empidonax minimus*	None
Philadelphia Vireo, *Vireo philadelphicus*	None
Golden-winged Warbler, *Vermivora chrysoptera*	4
Blue-winged Warbler, *Vermivora pinus*	5
Nashville Warbler, *Vermivora ruficapilla*	None
Yellow Warbler, *Dendroica aestiva*	A few yearly
Magnolia Warbler, *Dendroica magnolia*	9
Cape May Warbler, *Dendroica tigrina*	None
Black-throated Green Warbler, *Dendroica virens*	4[b]
Blackburnian Warbler, *Dendroica fusca*	3
Chestnut-sided Warbler, *Dendroica pensylvanica*	6[c]
Bay-breasted Warbler, *Dendroica castanea*	6[d]
Black-poll Warbler, *Dendroica striata*	3
Oven-bird, *Seiurus aurocapillus*	4
Northern Water-thrush, *Seiurus noveboracensis*	1
Canada Warbler, *Wilsonia canadensis*	2
Scarlet Tanager, *Piranga olivacea*	5
Rose-breasted Grosbeak, *Hedymeles ludovicianus*	4

[a] One "record"=one or more individuals of a given species seen on one day.

[b] One bird for each "record" except on May 1 and 2, 1940, when a number were seen. See text discussion of April 30–May 3, 1940.

[c] Three of these were on April 30–May 2, 1940; another was of a bird that struck the State Capitol light on May 17, 1940.

[d] Three of these were on April 30–May 2, 1940.

an able field observer who assisted me for several years at Baton Rouge, spent the period of April 22 to May 12 at Memphis, Tennessee, for the express purpose of collecting comparable data. During the whole period, only four species of transient trans-Gulf migrants were found at Baton Rouge, and these were represented by a total of only seven individuals: one Blue-winged Warbler, April 18; two Yellow Warblers, April 24; two Scarlet Tanagers, one on April 16 and one on April 24; two Rose-breasted Grosbeaks, on April 24. From April 18 to 24 and from April 25 to May 7, absolutely no transient trans-Gulf migrants were found. Yet on April 22 at Memphis, Burdick recorded 15 species (13 species of warblers and 2 thrushes) of transient trans-Gulf migrants, and during the period April 22 to May 9, he recorded a total of 26 species of transients. Some were recorded throughout the period, for example, the Olive-backed Thrush (6 to 35 individuals daily), and the Black-poll Warbler (8 to 25 individuals daily). The Nashville Warbler, for which there are no spring records at Baton Rouge, was seen by Burdick from April 22, when he recorded 75 individuals, to May 5. (Cf. Burdick and Tucker, 1943; see also Table 9.)

An occurrence on the night of April 20, 1933, is of particular interest. Between 8:30 and 9:00 P.M. a thunder storm accompanied by considerable hail occurred at Baton Rouge. The resulting damage to local bird life has been described by Gates (1933). Twenty-seven Scarlet Tanagers were found dead or injured on or near the University campus on the morning following the storm. Since these 27 birds probably represent only a fraction of those actually killed, it is likely that a considerable flight of the species was migrating over Baton Rouge on this night. The date, April 20 (1933), stood for 10 years as the earliest spring "arrival date" for the Scarlet Tanager at Baton Rouge (until April 16, 1943, when a single individual was seen), and the species was noted on only four occasions in the interim. Hence, here is a species that has been noted an aggregate of only five times in 10 years at Baton Rouge; yet it is definitely a trans-Gulf migrant, and there is evidence that on April 20, 1933, a considerable number were passing over Baton Rouge.

Average Arrival Dates

Because the appearance of transient trans-Gulf migrants at any particular locality in the lower Mississippi valley is dependent largely on specific weather phenomena, arrival dates are highly variable. Ornithologists in other sections of the United States may find it useful to compute average arrival dates for each migrant species, but it is apparent from the foregoing statements that in the Gulf coast region average arrival dates are of little or no significance. The "average" date so computed is not the usual arrival date of the species in question (that is, the

date on which they begin passing over the area) but is in general the average date on which polar-front weather has precipitated birds in that particular area.

Earliest Arrival Dates

The recording of the initial appearance of a species in a given area in any particular year is admittedly a highly fortuitous matter. But in regions where there are a number of observers in the field almost daily over many consecutive years, the "earliest date of arrival" of a species assumes considerable significance. Although the rate of advance up the Mississippi valley may be variable from year to year, depending on a number of factors such as the variable rate of the "advance of spring" up the valley (Cooke, 1888:37–41), the dates of arrival of trans-Gulf migrants that breed along the Gulf coast and elsewhere in the extreme lower Mississippi valley are remarkably uniform from year to year, and the earliest dates of their arrival there are consistently in advance of the arrival of the same species several hundred miles up the Mississippi valley—which is exactly what one would expect.

Dates of arrival on the Gulf coast of *transient* trans-Gulf migrants are, on the other hand, highly variable, and many species are recorded consistently much earlier in Tennessee, for example, than on the coast itself. If these transients regularly descended on reaching land, one would expect the "first arrival" dates along the coast to be earlier than those recorded farther inland.

In Table 3, 24 species of birds that do not breed in the lower Mississippi valley but are known to be trans-Gulf migrants in the spring are listed with the earliest dates on which they have been recorded in several regions. The earliest dates of arrival at Memphis, over 300 miles north of the Gulf coast, are in many instances earlier than those recorded at Pensacola, on the coast of Mississippi, or at Baton Rouge. Fifteen (63 per cent) of the species listed in Table 3 have been recorded earlier at Memphis than they have at Baton Rouge. Ten have been detected at Memphis earlier than on the coast of Mississippi, and the same number have been seen earlier at Memphis than at Pensacola. Similarly, Nashville records are in some instances earlier than those recorded at certain Gulf coast stations. Six (25 per cent) of the species listed have been recorded earlier either at Memphis or Nashville than at Pensacola, on the coast of Mississippi, or at any locality on the coast of Louisiana. These figures are significantly high when one considers the long period of years over which Gulf coast records have been kept and the greater number of ornithologists who have studied there compared with the number who have made observations at the two Tennessee stations. This consistently earlier recording of transients in Tennessee can be explained only if incoming migrants as a rule (i.e., during fine weather) pass over the Gulf coast in the spring and proceed far inland before descending.

TABLE 3

EARLIEST ARRIVAL DATES FOR CERTAIN TRANSIENT MIGRANTS IN VARIOUS SOUTHERN REGIONS *

Species	Coastal Louisiana (misc.) 1885–1944	Coastal Mississippi 1935–43	Pensacola, Florida 1916–43	Baton Rouge, Louisiana 1933–44	Memphis, Tennessee 1926–43	Nashville, Tennessee 1915–43	Athens, Georgia 1921–35
Black-billed Cuckoo (*Coccyzus erythropthalmus*)	April 11	May 5	May 2	April 21	April 28	May 3	April 27
Yellow-bellied Flycatcher (*Empidonax flaviventris*)	May 12	May 12	no spring record	no spring record	May 11	no spring record	no spring record
Olive-backed Thrush (*Hylocichla ustulata*)	April 19	April 19	April 5	April 20	April 11	April 16	April 10
Gray-cheeked Thrush (*Hylocichla minima*)	April 20	April 12	no spring record	April 22	April 23	April 8	May 20
Veery (*Hylocichla fuscescens*)	April 20	April 20	April 15	April 20	April 20	April 24	April 19
Philadelphia Vireo (*Vireo philadelphicus*)	April 26	May 7	April 18	no spring record	May 2	April 28	no spring record
Golden-winged Warbler (*Vermivora chrysoptera*)	April 6	April 10	April 5	April 17	April 13	April 26	April 26
Blue-winged Warbler (*Vermivora pinus*)	March 22	March 27	April 4	April 12	April 3	April 7	April 16
Tennessee Warbler (*Vermivora peregrina*)	March 28	April 7	April 12	April 6	April 9	April 21	May 1
Nashville Warbler (*Vermivora ruficapilla*)	April 11	no spring record	no spring record	no spring record	April 16	April 22	no spring record
Magnolia Warbler (*Dendroica magnolia*)	April 20	April 19	April 27	April 17	April 21	April 18	April 15
Cape May Warbler (*Dendroica tigrina*)	April 27	May 1	no spring record	no spring record	April 27	April 16	April 14
Black-throated Blue Warbler (*Dendroica caerulescens*)	March 22	April 30	no spring record	no spring record	May 5	April 21	April 7

TABLE 3 (*Continued*)

Species	Coastal Louisiana (misc.) 1885–1944	Coastal Mississippi 1935–43	Pensacola, Florida 1916–43	Baton Rouge, Louisiana 1933–44	Memphis, Tennessee 1926–43	Nashville, Tennessee 1915–43	Athens, Georgia 1921–35
Black-throated Green Warbler (*Dendroica virens*)	April 8	March 24	March 20	May 1	March 19	March 20	March 24
Blackburnian Warbler (*Dendroica fusca*)	March 27	March 27	April 5	April 26	April 5	April 7	March 29
Chestnut-sided Warbler (*Dendroica pensylvanica*)	March 21 (winter ?)	April 14	April 12	April 16	April 16	April 22	April 20
Bay-breasted Warbler (*Dendroica castanea*)	April 17	April 19	April 24	April 17	April 22	April 19	April 26
Black-poll Warbler (*Dendroica striata*)	April 15	April 26	April 23	April 25	April 21	April 18	April 19
Oven-bird (*Seiurus aurocapillus*)	March 28	March 31	April 4	April 21	April 11	April 1	April 3
Northern Water-thrush (*Seiurus noveboracensis*)	April 6	April 19	April 5	April 16	April 19	?	April 15
Canada Warbler (*Wilsonia canadensis*)	no spring record	May 10	no spring record	May 1	April 24	April 28	April 27
Bobolink (*Dolichonyx oryzivorus*)	April 1	April 30	April 20	April 19	April 28	April 19	April 14
Scarlet Tanager (*Piranga olivacea*)	April 3	April 3	April 5	April 15	April 16	April 6	April 11
Rose-breasted Grosbeak (*Hedymeles ludovicianus*)	April 16	April 15	April 21	April 21	April 18	April 18	April 22

* Data in this table have been drawn from the following sources: *Louisiana localities*—From Oberholser (1938), from records and specimens in the Louisiana State University Museum of Zoology, and from records and specimens assembled by Thomas D. Burleigh and Thomas R. Howell at New Orleans; the term "Coastal Louisiana" refers to the combined records from New Orleans, Grand Isle, and Cameron. *Coastal Mississippi*—Burleigh (1944). *Pensacola, Florida*—From records and specimens assembled by Francis M. Weston. *Athens, Georgia*—Burleigh (1938). *Memphis, Tennessee*—Records assembled by Ben B. Coffey and his associates and from specimens collected by Eugene Wallace, Austin W. Burdick, and Robert Tucker and deposited in the L.S.U.M.Z. *Nashville, Tennessee*—From records and specimens assembled by Albert F. Ganier and his associates.

Extent of the Coastal Hiatus

There is considerable evidence that the "coastal hiatus" in Mississippi valley migration extends northward across the entire Gulf coast region well beyond the 31st parallel of latitude. Just how far inland the hiatus extends requires much additional investigation, but the most southern locality in the Mississippi valley with a "normal" spring migration seems to be Memphis, Tennessee (Map 1). There are minor fluctuations discernible in the flow of migrants in this region, but for the most part, the place throngs day after day with migrants. Many of the species listed in Table 2 as rare or absent in spring at Baton Rouge are very common in migration at Memphis. Hence the northern edge of the hiatus must lie to the south of Tennessee.

Further investigation will probably show that the relative abundance of migrants increases in direct proportion to the distance from the coast. During the period 1929 to 1932, I observed birds at Monroe and Ruston in northern Louisiana; between 1932 and 1943, I received many valuable notes from the late Mrs. George H. Lowery, Sr., who lived at Monroe and made a study of the bird life in that vicinity. Although there is need for much additional field work in northern Louisiana, it can be said that spring migration at Monroe is far more pronounced than at Baton Rouge, but probably appreciably less than at Memphis. Nearly all of the trans-Gulf migrants are seen regularly in spring at Monroe, yet their numbers do not seem to approach those recorded slightly farther north, at Memphis. Burleigh's careful and intensive survey of the bird life at Athens, Georgia (1938), likewise shows that fewer migrants are seen at that locality than slightly farther north in the lower Allegheny Mountains (Pearson, Brimley, and Brimley, 1942).

Speculation on the destination of the Scarlet Tanagers prior to encountering the hail storm at Baton Rouge (see above) gives some indication of the extent of the coastal hiatus. Assuming that the tanagers had continued flying at a minimum speed of 25 m.p.h., they could have covered a distance of approximately 250 miles and reached southern Arkansas or northern Mississippi by daybreak.

There is, of course, no way of knowing whether the tanagers had only recently departed, during the preceding late afternoon, from some coastal region, en route northward via Baton Rouge, or whether, on the contrary, they were still in continuous flight from some tropical locality. The time of their passing Baton Rouge, about two hours after sunset, suggests the former inference, since it would require just about that length of time for the birds to reach Baton Rouge from almost any Gulf coast point.

But regardless of whether this particular flight of tanagers had its beginning in tropical America or on the Gulf coast of Louisiana, the significant feature of the coastal hiatus is again illustrated: Migrants which arrive on the northern Gulf coast during favorable weather con-

tinue inland a considerable distance and hence miss the greater part of the Gulf coast region. Migrants which arrive on the northern Gulf coast during unfavorable weather are precipitated in the coastal areas, but as the weather clears, they resume their flight, the initial part of which again carries them over vast stretches of the Gulf coast states.

Trans-Gulf Migrants That Breed in the Lower Mississippi Valley

Discussion up to this point has been concerned wholly with transient trans-Gulf migrants, i.e., species that do not breed along the Gulf coast or in the extreme lower Mississippi valley. Whereas transient migrants are decidedly rare [5] and arrive irregularly throughout interior Louisiana, Mississippi, and other southern states, migrants which stop to breed arrive on their breeding grounds with remarkable regularity.

The Prairie Warbler (*Dendroica discolor*) is a case in point. During the past 10 years, the species has been recorded only once within the immediate environs of Baton Rouge, where it does not breed. However, it does breed abundantly 20 miles northeast of Baton Rouge near Baywood in the cut-over pine-hardwood region, and it appears regularly there on or around April 1. In view of the abundance of the species just beyond Baton Rouge we might surmise that it would be at least fairly common in migration at the latter place. Such is not the case. The single Baton Rouge record is an individual seen on April 21 (1940), nearly three weeks later than the species regularly appears at Baywood. Similarly, the Worm-eating Warbler (*Helmitheros vermivorus*) breeds fairly commonly in the wooded beech-magnolia ravines of West Feliciana Parish, but has not yet been recorded in the spring 30 miles south at Baton Rouge.

At Baton Rouge such common nesting species as the Parula, Yellow-throated, Swainson's, Prothonotary, Kentucky, and Hooded Warblers, the Chat, the Warbling Vireo, Red-eyed, and Yellow-throated Vireos, Orchard and Baltimore Orioles, Acadian Flycatcher, Wood Pewee, Eastern Kingbird, Nighthawk, Chuck-will's-widow, Yellow-billed Cuckoo, Summer Tanager, Purple Martin, Painted and Indigo Buntings, and others, arrive on dates that are comparable with arrival dates at other Gulf coast stations where the species also breed.

Analysis of the status of certain species at Baton Rouge, Pensacola, Gulfport, and New Orleans shows clearly the difference between the arrival of birds in areas where they are known to breed and in areas where they are strictly transient. For example, Swainson's Warbler (*Limnothlypis swainsonii*) breeds commonly at Baton Rouge and at New Orleans, but not at Gulfport nor at Pensacola. The species arrives regularly at Baton Rouge on or shortly after April 2 and has been noted as early as March 30 at New Orleans. At Pensacola, where Swainson's

[5] This, of course, leaves out of consideration herons, swallows, and other birds that are, in part, coastwise migrants.

Warbler does not breed, it has not yet been recorded during spring migration. Yet the species is known to breed a short distance north of Pensacola (Weston, *in litt.*), and just east of Pensacola at Whitfield (Howell, 1932), where Worthington and Todd (1926:223) took 20 specimens between April 4 and May 1, 1903.

Further, Swainson's Warbler breeds at Brooklyn, Mississippi (Burleigh, *in litt.*), and at New Orleans, places which are respectively 50 miles north and 50 miles west of Gulfport. Nevertheless, in the eight years of his intensive field work at Gulfport, Burleigh has observed the species but once in the spring. This was an individual seen on April 19, 1943. The following quotation is taken from Burleigh's field notes for that date: "Weather clear with strong, cold, northwest wind [typical polar-front weather]. Island alive with birds for the first time this year" (Table 9). Burleigh, on the same day, procured his earliest Gulfport record for the Bay-breasted Warbler (*Dendroica castanea*) and the Northern Water-thrush, the former being six days earlier than his earliest previous record for the spring. The principal conclusions to be drawn from these data are: Swainson's Warbler is common after April 1 at localities on the Gulf coast where it nests; in areas where it does not nest, it is rare or absent in the spring; and when it does occur in such areas, its appearance there is correlated with a general precipitation of transients as a result of unfavorable weather conditions.

The situation with respect to the Dickcissel (*Spiza americana*) is similar to that of Swainson's Warbler, for the species does not breed at either Pensacola or Gulfport, but does breed locally at Baton Rouge and at New Orleans. At the two latter places it arrives regularly by April 15 and is often abundant by April 20. There are, however, no spring records for Gulfport, and Weston has seen the species but once at Pensacola in 28 years.

The Coastal Hiatus and Maps of Migration Routes

The absence of records for a given species from all coastal stations during prolonged periods of study must by no means be taken as proof that the species in question is not a trans-Gulf migrant. Given the right kind of weather and a competent observer at exactly the right spot, species which have previously gone undetected at coastal stations may finally be recorded in great numbers.

For example, up to 1942 there were no spring records for the Nashville Warbler from southern Louisiana, Mississippi, Alabama, or western Florida. But between April 9 and 11, 1942, at Cameron, Louisiana, the Nashville Warbler was found in considerable numbers among the swarms of migrants that were precipitated on the coastal ridges by polar-front weather on April 9 and 10. The following excerpts are taken from my field notes: "April 9: Strong north winds attended by very cloudy and unsettled weather . . . April 10: Skies cleared about noon,

but wind continued out of the north throughout the remainder of the day and part of that night . . . Collected two nighthawks from a small flock feeding low over the edge of marsh at dusk, and both, much to our amazement, proved to be the Texas Nighthawk (*Chordeiles acutipennis*). This is the first Louisiana record and a considerable eastward extension of range . . . April 11: Plenty of migrants of all kinds on the narrow, wooded cheniers . . . Secured third Texas Nighthawk . . . Concentrations of birds noted today are precisely what we expected in view of the weather. Migrants coming across the Gulf in the face of the north wind dropped down upon the first bit of land instead of passing on inland . . . Warblers found in virtually every bush. Probably as many as several thousand warblers alone seen in course of day. These consisted of 26 species, the most surprising being the Nashville Warbler, which was present in considerable numbers" (Table 7). In all probability the Nashville Warbler will eventually be found in comparable numbers at other Gulf coast stations when a weather barrier occurs at the given locality at the precise time that a flight of Nashville Warblers reaches that point.

Similarly, the Philadelphia Vireo had not been recorded in spring at any coastal station before April 18 and 19, 1919, when Weston saw one at Pensacola. It has since been recorded on the coast only from Gulfport (one collected by Burleigh on May 7, 1941) and from Cameron (three collected by Sutton and Lowery on April 26 and 30, 1942). Thus the absence of the Philadelphia Vireo from most Gulf coast regions is by no means an indication that the species is not a regular trans-Gulf migrant. Since during favorable weather all transient trans-Gulf migrants fly far inland before descending, the Philadelphia Vireo can be expected at any coastal station only when forced down by adverse weather conditions.

The Warbling Vireo (*Vireo gilvus*) is a further case in point. The species breeds at certain localities within the coastal hiatus but not on the coast itself. In those localities where it does not breed, it has the status of other transient trans-Gulf migrants, i.e., it is absent entirely, rare, or highly intermittent in occurrence. The Warbling Vireo does not breed at Pensacola, Gulfport, or Cameron, and it has been recorded at none of these localities in the spring. At localities within the coastal hiatus where the species breeds, it has the status of all species of locally breeding trans-Gulf migrants, i.e., it is regular in appearance. At Baton Rouge, for example, where the Warbling Vireo breeds, it arrives regularly on or about March 26.

Wilson's Warbler (*Wilsonia pusilla*) has not been noted in spring from any locality in the South that lies east of Texas and less than 150 miles from the coast. However, the species reaches localities in northern Georgia and North Carolina on dates almost simultaneous with its arrival in the middle Mississippi valley. The great number of individuals that migrate northward parallel to the Allegheny Mountains must,

therefore, as Cooke concluded 40 years ago (1904:127–128), jump over the southern part of the Mississippi valley and the Gulf of Mexico from their winter home in southeastern Mexico.

The Connecticut Warbler (*Oporornis agilis*) is generally supposed to migrate northward through the Florida Peninsula, and the Mourning Warbler (*Oporornis philadelphia*) is supposed to migrate northward by way of eastern Mexico and the Texas coast (Map 2). They are said to converge in the middle Mississippi valley (Cooke, 1904 and 1915; Lincoln, 1935 and 1939; Wetmore, 1926; Chapman, 1932; and others). Practically every writer on bird migration cites the Connecticut Warbler as an example of a species that reaches the United States exclusively by way of the Florida Peninsula. In fact, no alternative route appears to have been proposed. Let us examine the true status of the species in

Map 2. The commonly accepted spring migration routes (shaded areas) of (1) the Mourning Warbler (after Chapman), and (2) the Connecticut Warbler (after Lincoln and others). The winter range (in part) of the Mourning Warbler is shown in black. The migration routes postulated in this paper are indicated by the dotted lines.

Florida. Howell (1932) describes it as "a rare migrant in spring and fall." Citing presumably all authentic records for the state, he gives records for only five localities where the bird has been seen in spring, two of which are lighthouses. In the West Indies, the species has been recorded only from the Bahama Islands (Bond, 1936 and 1940). On the other hand, the Mourning Warbler which most, if not all, writers describe as reaching the United States by way of eastern Mexico and the coast of southern Texas, has been recorded three times from Florida (Howell, 1932); two of these records were in the spring. Frazar (1881: 251) saw "large numbers" of Mourning Warblers in migration 30 miles south of the mouth of the Mississippi River on April 22, 1881.[6]

There is additional ground for assuming that the Connecticut and Mourning Warblers are at least in part trans-Gulf migrants. Both have been noted in the spring in northern Louisiana, and both are fairly regular in their occurrence at Memphis, Tennessee, localities which are rather far to the west unless a more direct trans-Gulf flight is admitted. Furthermore, Sutton (1938) reports the taking of a male specimen of the Connecticut Warbler in western Oklahoma on May 18, 1937. This record is after all not so surprising when we recall that the species breeds as far west as Alberta. The earliest spring records for the Connecticut Warbler in northern Louisiana, at Memphis, and at Nashville (April 27, 27, and 21, respectively) are earlier than Burleigh's earliest record (May 7) for the species at Athens, Georgia (Burleigh, 1938). On the basis of the alleged "Florida flyway," Athens should get the vanguard of the migrants.

An additional point of considerable importance is the fact that the Connecticut and Mourning Warblers are late migrants. The earliest Florida record for the Connecticut Warbler is May 4, and the bulk of the records for that state are past the middle of May. In this latitude, distinct polar-front weather is less prevalent during May than during April, and hence species which migrate in late May are much less likely to be precipitated on the coast by local weather phenomena than are species which migrate during April. The absence of eastern Gulf coast records for the Connecticut Warbler is therefore not nearly so surprising as the lack of spring records for the Gray-cheeked Thrush and the Swainson's, Golden-winged, and Nashville Warblers at Pensacola, or the absence of spring records for the Warbling Vireo, Dickcissel, and Nashville Warbler at Gulfport. Various other birds that are far better known and in some cases much more easily detected than either the Mourning or the Connecticut Warblers have been recorded at none of the Gulf coast stations for many years, and yet no circuitous routes of migration have been proposed for them. It is thus apparent that undue emphasis has been placed on the absence of records for the Mourning and Connecticut Warblers in the lower Mississippi valley and along the Gulf

[6] See Note 2, p. 95.

coast. This hiatus in the spring "occurrence" of these species represents, in all probability, nothing more than the area over which trans-Gulf migrants habitually pass before descending.

Weather and Migration Waves

Through the courtesy of Mexican weather authorities, I obtained limited but valuable information pertaining to the state of the weather on the Yucatan Peninsula and in the region bordering the Bay of Campeche on days (1939–1943) when certain weather phenomena are known to have occurred in the northern Gulf coast region (U. S. Weather Bureau, 1933–1943). A few of these cases are analyzed in Tables 4 to 9.

Many migrant North American birds are known to pass northward overland through Central America into southeastern Mexico, whence they depart for the United States via the trans-Gulf flyway. We can assume with fair certainty that, should clear weather prevail in the Yucatan-Campeche region, north-bound migrants would not accumulate there; that is, upon reaching the Bay of Campeche or the northern part of the Yucatan Peninsula, migrants would proceed directly across the Gulf.[7] So long as favorable conditions prevailed in both the Yucatan and Gulf coast regions, the steady flow of trans-Gulf migrants would continue far inland and descend over a comparatively wide area in the middle Mississippi valley. The hundreds of thousands of birds that stream across the Gulf flyway, even though dispersing widely upon alighting, insure any interior station, if far enough inland, a more or less smooth stream of north-bound migrants. But north Gulf coast regions would be almost, if not wholly, without transient migrants.

[7] An inferential basis for this assumption is supplied by our knowledge of what south-bound migrants do on the northern Gulf coast in fall prior to undertaking their return flight across the Gulf. Although the fall migration is known to be less hurried than the spring, migrants do not tend, as a general rule, to accumulate along the coast unless there are strong winds from the south. The subject of fall migration in this region will be discussed in detail in a later paper.

TABLE 4
The Weather and Migration, March 1–4, 1939

1939 March	Yucatan Peninsula	Gulfport, Mississippi	
	Weather	Weather	Migrants
1–3	Clear; SE wind	Cloudy; slight rains; S wind	None
4	[no data]	Polar-front weather: rains; NW wind	Large number of early migrants

[Interpretation: Between March 1 and 3 migrants leave Yucatan region under favorable weather conditions. Since they encounter favorable weather on reaching the northern Gulf coast, they continue northward over the coast, and no migrants are recorded there. On March 4 incoming migrants encounter head winds associated with advancing polar fronts and are precipitated on the first available land.]

TABLE 5

THE WEATHER AND MIGRATION, APRIL 23–MAY 4, 1940

1940 April	Yucatan Peninsula	Gulfport, Mississippi		Baton Rouge, Louisiana	
	Weather	Weather	Migrants	Weather	Migrants
23–24	Slight SE wind	Partly cloudy; S wind	Small number	Partly cloudy; SW wind	None
25	Same	Heavy overcast; rain; S wind	Small number	Partly cloudy; slight rain; variable NE wind	None
26	Same	Polar-front weather: cloudy; heavy rains; N wind	Record number	Clear; E wind	None

[Interpretation: Migrants, leaving Yucatan region under favorable conditions, at first encounter favorable weather north of the Gulf and continue inland, passing over the northern Gulf coast region as well as the middle region (represented by Baton Rouge). On April 26, however, migrants are precipitated by polar-front weather at Gulfport (and presumably elsewhere along the part of the coast covered by the polar front).]

27	Light showers on E coast; SE wind	Clear; S wind	Almost none	Cloudy; SE and E wind	[no data]
28	Slight SE wind	Partly cloudy; S wind	None	Cloudy; SE wind	Almost none
29	Same	Partly cloudy; showers; S wind	None	Polar-front weather: heavy overcast; variable winds; 2.44 in. rain; electrical storm	Moderate number
30	Same	Polar-front weather: heavy overcast; heavy rain; strong S wind shifting to N	Moderate number	Continued polar-front weather	Large number

[Interpretation: Migrants precipitated on the coast on April 26 leave on April 27 and 28, when the weather clears, and pass over the middle region, where the weather continues fair. Since favorable conditions still prevail in the Yucatan region, the northward flow of migrants continues, and these pass over the coast as well as over the middle region until April 29, when polar-front weather precipitates migrants at Baton Rouge (and presumably along the entire polar front). The polar front moves southeastward, and on April 30, migrants are again precipitated at Gulfport.]

May 1	Slight N wind	Continued polar-front weather: heavy rains; NW wind	Record number (notably on coastal islands)	Cloudy in forenoon; N wind. Clear later; SW wind	Record number
2	SE wind	Clear; N wind	Almost none	Clear; W wind	Record number
3	Same	Clear; N wind	Almost none	Clear; NW wind	Moderate number
4	Same	Clear	Almost none	Clear; SW wind	Almost none

[Interpretation: North wind over the Yucatan Peninsula on May 1 retards departure of migrants; hence, though a north wind prevails on the northern Gulf coast on May 2, there are few or no incoming migrants to be precipitated.]

TABLE 6

THE WEATHER AND MIGRATION, MARCH 25–29, 1942

1942 March	Yucatan Peninsula	Grand Isle, Louisiana	
	Weather	Weather	Migrants
25	Dry; SE wind	Cloudy; S wind	[no data]
26	Same	Same	[no data]
27	General showers; SE wind	Polar-front weather: heavy overcast; strong N wind	Large number

[Interpretation: Migrants leaving Yucatan region on March 25 encounter favorable weather on the northern Gulf coast, but those leaving on March 26 and 27 are precipitated in coastal areas by an advancing polar front.]

28	General showers; strong N wind	Skies clear; wind shifting from N	Record number
29	[no data]	Clear; S wind	Moderate number (apparently no new arrivals)

[Interpretation: Presumably almost no migrants leave the Yucatan region on March 28 in face of strong N wind and other polar-front phenomena, and hence no new arrivals are detected on the northern Gulf coast on March 29. Favorable weather in the Grand Isle region on March 29 permits resumption of northward flight by birds precipitated there on the two preceding days.]

TABLE 7

THE WEATHER AND MIGRATION, APRIL 7–11, 1942

1942 April	Yucatan Peninsula	Cameron, Louisiana	
	Weather	Weather	Migrants
7–8	SE wind	Cloudy; heavy rains; strong, variable S wind	[no data]
9	Scattered showers; SE wind	Polar-front weather: heavy rains; N wind	Record number
10	General rains; N wind	Continued polar-front weather	Record number increased by new arrivals
11	N wind	Skies clear; temperature rises; wind shifts to S	Record number

[Interpretation: The stream of migrants leaving the Yucatan region under favorable weather conditions is not interrupted until at least April 10. Encountering polar-front weather, the migrants are precipitated on the northern Gulf coast on April 9 and continue to accumulate there on April 10. The tremendous numbers recorded at Cameron on April 11 possibly included arrivals on that day, but it is probable that the change in weather in the Yucatan region stopped the stream of departing migrants on April 10.]

TABLE 8

THE WEATHER AND MIGRATION, MAY 5–9, 1942

1942 May	Yucatan Peninsula	Gulfport, Mississippi	
	Weather	Weather	Migrants
5	Clear to slightly cloudy; SE wind	Clear; warm; S wind	None
6	Same	Cloudy; S wind	None
7	Same	Polar-front weather: rain; N wind	Large number
8	Rain on E coast and in N; N wind	Skies clear; S wind	Small number
9	[no data]	Clear; warm; S wind	Almost none

[Interpretation: Migrants leaving Yucatan under favorable conditions on May 5 and 6 encounter similar conditions on northern Gulf coast and consequently pass inland over the coast before descending. On May 7 incoming migrants are precipitated by a polar front that advances to the Gulf coast on that date. Effects of polar front extend to Yucatan region on May 8 and stop the northward flow of migrants; at the same time fine weather on the northern Gulf coast causes the migrants precipitated on May 7 to resume their flight northward; and the region is then almost without migrants.]

TABLE 9

THE WEATHER AND MIGRATION, APRIL 14–20, 1943

1943 April	Yucatan Peninsula	Gulfport, Mississippi	
	Weather	Weather	Migrants
14–15	Cloudy; scattered showers; N wind	Cloudy; S wind	None
16	Cloudy; SE wind	Cloudy; intermittent rain; strong SE wind	One
17	Same	Same	Small number
18	Same	Same, but more unsettled	Moderate number
19	General rains, heavy on E coast; strong NW wind	Polar-front weather: heavy rains; strong NW wind	Record number
20	[no data]	Clear; cold; wind shifting to S	Small number

[Interpretation: On April 14 and 15 weather conditions prevent departure of migrants from the Yucatan region. At least some migrants leave on April 16 and 17 with the improved weather, and a few are precipitated on the Gulf coast on April 17. (Since the weather is semi-favorable along the coast, some migrants may proceed inland.) As the weather becomes more unfavorable, increasing numbers pile up on the coast until April 20, when there are no new arrivals because unfavorable weather in the Yucatan region has again prevented departure of migrants, and favorable weather on the northern Gulf coast permits the accumulated migrants there to resume their northward flight, thus emptying the region of its migrant bird life.]

Thus, with clear weather in both the Yucatan-Campeche and the Gulf coast regions, one may walk the length of Grand Isle, or search the woods about Baton Rouge or any other locality in the extreme lower Mississippi valley region, and not find a single transient migrant. This has been done time and again by all Gulf coast observers—not just for one day, but day after day so long as fine weather prevails.

Now let us assume that a polar front advances from the north and reaches the Gulf coast. The coastal islands and other coastal regions are then flooded with migrants. The migrants behind the polar front drift on northward. If the weather clears rapidly, the migrants retarded along the coast by the weather barrier leave almost simultaneously, and their first flight carries them far inland, over an extensive area of the coastal region. Ornithologists in the general area in which the major part of the flight finally descends record the appearance of a "wave."

On the other hand, let us suppose a period of inclement weather in the Yucatan-Campeche region. Just as south-bound migrants tend to accumulate on the northern Gulf coast in the fall in the face of bad weather, so, presumably the north-bound migrants accumulate in the Yucatan-Campeche area in the spring. This results in not only a large assemblage of individuals, but also a wide variety of species. Assuming that on the advent of clear weather a considerable part of the accumulated hordes start across the Gulf almost simultaneously, it is apparent that some section of the Mississippi valley region will shortly receive a large and diversified wave of migrants. Since, during the preceding days of bad weather, no migrants have crossed the Gulf, and since birds which crossed ahead of the bad weather have progressed far northward during the lull, the resumption of even the usual flow of migrants across the Gulf would produce a distinct wave; but this particular flight will contain not only the migrants of the usual steady stream, but also those which have accumulated during the bad weather in the Yucatan region. If, then, this flight encounters a new polar front as it crosses the Gulf, the precipitation on the northern Gulf coast will greatly exceed the precipitation resulting from the stopping of just the daily clear-weather flow of migrants.

This alternate passing over or dropping down of migrants that is recorded in the Gulf regions breaks up what would otherwise be a steady flowing stream of migrants, and waves of migrants result. There seems to be little doubt that this is an important factor contributing to the wave characteristic of northward migration which many writers have noted. The great fluctuations discernible in the southern states must extend in their effects considerable distances up the Mississippi valley and possibly throughout the eastern United States. However, the stupendous number of migrants moving up the valley would seem to have a tendency to produce a smoothing-out effect on the flow of migrants. As far north as Memphis, for instance, there is a more or less continuous stream of migrants, with only minor interruptions.

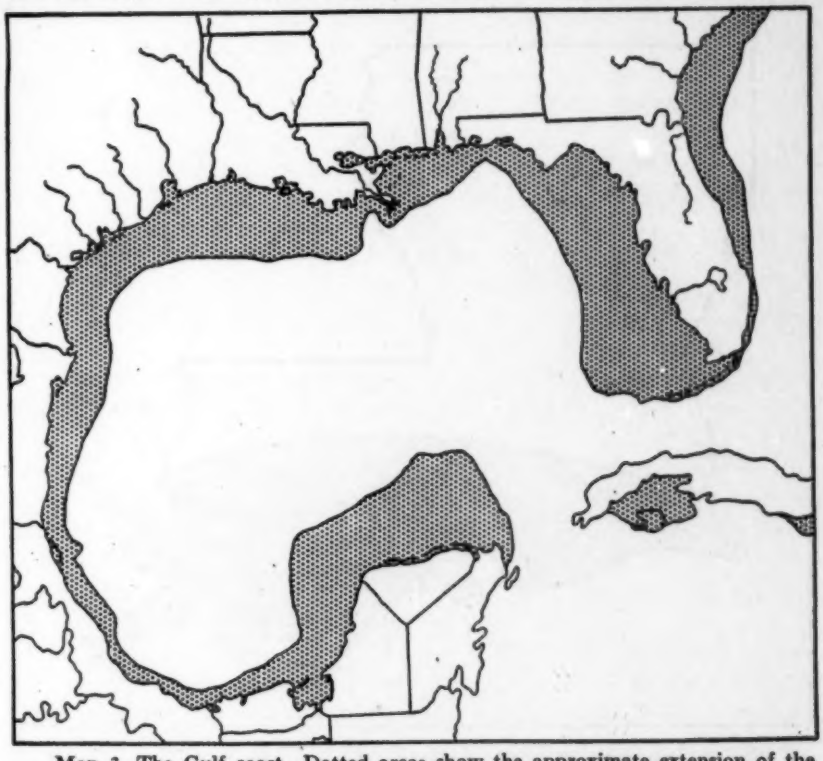
Of course, as birds progress up the valley, weather conditions might tend to retard migrants in this or that region, and new waves might result. However, waves in the upper Mississippi valley are apparently not comparable in intensity with waves on the Gulf coast. I have seen no account from northern regions which reports a complete absence of migrants once the spring procession has begun.

Geological Considerations

Ornithologists in general agree that the basic pattern of bird migration is closely correlated with Pleistocene or Ice Age history. Specific events in the Pleistocene history of the Gulf coast may or may not have a direct bearing on the present-day Gulf coast hiatus in migration, but they constitute a very interesting basis for cautious speculation.

The land bordering the Gulf of Mexico was by no means stable or fixed during late geologic time; it was, on the contrary, subject to frequent and radical alteration, a fact which must have had more than a minor influence on the pattern of trans-Gulf migration.

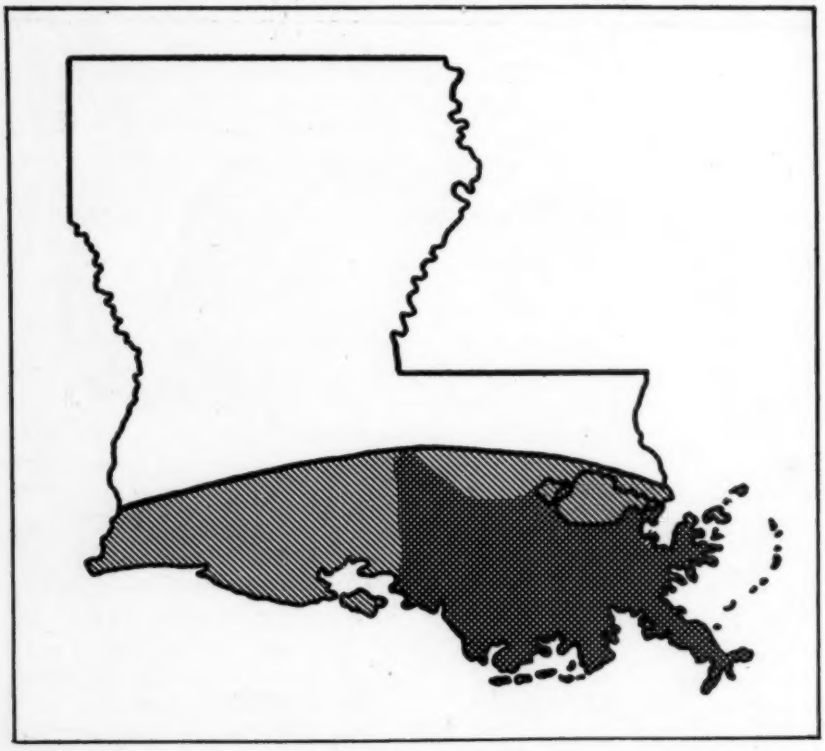
During the major glacial stages of the Pleistocene, the seas were lowered approximately 400 feet as a result of evaporation and subse-



Map 3. The Gulf coast. Dotted areas show the approximate extension of the coast during the maximal lowering of the seas in the major glacial stages of the Pleistocene. (Based on the 400-foot contour of bathometric charts.)

quent deposition of moisture as land-covering ice. This lowering of the seas effected great changes in the size and shape of the Gulf of Mexico and the adjacent land. Plotting the 400-foot contour of the Gulf, as is done in Map 3, presents a fairly accurate picture of the shore line of the Gulf during the maximum ice advance in each of the glacial stages. Florida, for instance, was in some places about twice as broad as it is today; southwestern Louisiana extended some 100 miles beyond its present limits; and the Yucatan Peninsula extended farther northward. That is, at the time that northern birds were being forced into the south, the Gulf was a much smaller body of water and hence much easier to cross.

During the interglacial stages, the melting ice of the retreating glaciers slowly refilled the seas, and it is possible that on occasions the level of the sea was somewhat higher than it is at the present day. Following the last, or Wisconsin, Glacial stage, the level of the Gulf rose rapidly for a period until the Gulf extended a considerable distance up



Map 4. Louisiana. Hatched area shows the approximate encroachment of the Gulf of Mexico during the interglacial stages of the Pleistocene. Cross-hatching represents the "Mississippi Embayment" which occurred about 7,000 years ago.

what is now the Mississippi delta region, reaching a point almost as far north as Baton Rouge (Map 4). Thus a considerable part of the "coastal hiatus" area was at times under water.

Summary

In the spring, during favorable weather, trans-Gulf migrants that do not breed in the Gulf coast region or in the lower Mississippi valley do not come down immediately on reaching land but fly far inland before descending.

During unfavorable weather, incoming migrants of all types are precipitated, sometimes in tremendous concentrations, on the first available land. They pile up on coastal islands and cheniers, at times even in coastal marshes and other unfavorable places.

Migrants which are forced by weather to stop on the shores of the Gulf coast resume their northward flight with the first favorable weather and pass over a vast area of the southern United States before again descending.

Since, depending on the state of the weather, incoming migrants either fly far inland or descend on the very edge of the Gulf coast, the intermediate area becomes an extensive "hiatus" in the path of the trans-Gulf flyway. Within this area, transient migrants are extremely rare, highly intermittent in their occurrence, or even wholly absent during many consecutive spring migrations.

The lack of spring records from the Gulf coast and the lower Mississippi valley for certain species is shown to be an insufficient basis for assuming that they are not trans-Gulf migrants.

Trans-Gulf migrants that breed in the Gulf coast region and in the lower Mississippi valley are regular in their arrival at their breeding grounds, although they may be rare or absent at places a few miles away.

Analysis of weather conditions in the Yucatan-Campeche region preceding specific dates on which migrants are known to have been precipitated on the coast of the United States because of weather barriers reveals that, in all cases examined, birds left the Yucatan-Campeche region under auspicious conditions. For those periods when unfavorable weather is known to have extended across the Gulf to the Yucatan-Campeche region, the available evidence shows that the northward flow of trans-Gulf migrants was stopped, only to be resumed, and in increased magnitude, when the weather permitted.

The data indicate that the "waves" characteristic of spring migration in the Mississippi valley are caused primarily by two factors, both dependent on weather conditions: the alternate passing over or dropping down of migrants that is recorded in the Gulf regions; and the recurrent interruptions of the stream of migrants leaving the Yucatan-Campeche region.

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ON THE HABITS AND NEST OF THE ANT-THRUSH *FORMICARIUS ANALIS*

BY ALEXANDER F. SKUTCH

IN THE lofty forests of the lowlands of Costa Rica and Panama, one of the most distinctive bird notes is the mellow, resonant whistle, usually twice repeated, of the ant-thrush (*Formicarius analis*). The bird-watcher may hear the triple whistle a score of times before he catches a glimpse of the dark-colored, long-legged bird of about the same size and much the same aspect as a small rail. Alert and wary, one of these birds will usually detect the approach of an intruder while still some distance away, and will quietly disappear through the undergrowth—using its legs rather than its wings for locomotion. With dainty, deliberate steps, it walks over the litter of the forest floor, the short, abruptly erect tail tilting forward with each step. The dark brown, black, olive, and gray of the plumage blend so well with the fallen dead leaves of the background that whenever the bird pauses for a moment its form can be distinguished only with difficulty in the dim light that has been filtered through more than a hundred vertical feet of heavy foliage. (The Panama Ant-thrush, *Formicarius analis panamensis*, and Hoffmann's Ant-thrush, *F. a. hoffmanni*, are rather similar in appearance, and I have detected no difference in their voice or behavior.)

This ant-thrush has a fairly varied vocabulary. The call it most often uses is the triple whistle with the first note of the series longest and loudest, the whole sounding a trifle wistful or melancholy to human ears. But at times the bird voices a longer sequence of these whistles—rarely as many as ten. It will hesitantly approach the man who cleverly imitates this call—in fact, the first ant-thrush I ever saw was called out of the undergrowth of the forest on Barro Colorado Island by Dr. Frank M. Chapman. When alarmed, this ant-thrush utters a sharp, clear, somewhat explosive *tleet*, sometimes repeated in a continuous sequence. The note is quite as characteristic of the bird as its whistle; it cannot easily be confused with the call of any other bird of the forests where this ant-thrush dwells.

Formicarius analis is as strongly attached to the ground as any rail. I have never seen birds of this species perch on a bough; and they are quite as reluctant to fly as the forest quails (*Odontophorus*) among which they live. It is unfortunate that the most terrestrial of all ant-birds should be the type genus of the family, for the majority of the Formicariidae are arboreal and are only rarely seen on the ground; they live in the lower half of the forest, or else in thickets and bushy growth. Even the species that forage with the army ants hop down briefly to snatch an insect from the forest floor, then promptly rise again to some low perch where they watch and wait for another victim. Yet the strong-legged ground-foraging antpittas of the genus *Grallaria* hop

rather than walk and thus clearly link the numerous arboreal members of the family with the terrestrial *Formicarius*.

On January 23, 1931, on Barro Colorado Island, Canal Zone, I was walking along the Armour Trail through heavy forest when I observed a Panama Ant-thrush foraging not far ahead of me. I stopped short, and the bird, apparently undisturbed, continued to hunt for food in the middle of the pathway, then moved off to one side where the ground vegetation was so sparse that I could easily observe all its movements. Still assiduously hunting, it worked around in a circle that led it back to within three yards of where I quietly stood; it picked up a few morsels there, then deliberately walked away and was lost to view amid the undergrowth. While foraging, it picked from the ground and swallowed small objects that I could not identify; and often with its rather short, black bill it flicked aside fallen leaves in search of its food [1]—a habit also of the antpittas (*Grallaria*) and the Bicolored Antcatchers (*Gymnopithys bicolor*)—but it never scratched with its feet.

I have more extensive notes on Hoffmann's Ant-thrush, which inhabits the Pacific side of southern Costa Rica, ranging from sea level up into the mountains to at least 3,000 feet. On April 30, 1942, I spent many hours in a blind on the forested ridge that rises steeply behind my home in the Térraba Valley in southern Costa Rica. I was watching the nest of a pair of Ruddy Quail Doves (*Oreopeleia montana*), built amid the rather dense undergrowth. About the middle of the morning, I heard the mellow triple whistle, then the sharp *tleet tleet*, of an ant-thrush. Soon through the little rectangular window at my right, I glimpsed the shy bird—the first of the kind I had seen in the six months I had spent in these forests. It had caught a small snake, brownish above and bright coral-red below, a little less than a foot in length, and was pecking it and knocking it about on the ground with its bill. It continued this for a good while, until presently another ant-thrush—probably the mate of the first—hurriedly approached as though to take the snake. To my great disappointment, the intervening undergrowth prevented a full view of what ensued; but I could see that the snake, still squirming, was pecked and shaken a good while longer, until at last both ant-thrushes and victim were lost to view amid the undergrowth. Since other antbirds give food to their mates—I have seen the Spotted Antbird (*Hylophylax naevioides*), the Antwren (*Microrhopias quixensis*), and others do this—I should not be surprised if the snake passed from one bill to the other before it was devoured.

On May 21, 1942, as I searched for nests through the undergrowth of another part of the forest in which I had seen the birds with the snake, a Hoffmann's Ant-thrush flew in front of me, startling me with

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[1] Van Tyne (1935:28) found the food of *Formicarius analis pallidus* in Petén to consist of "snails and a few beetles."

its clear, sharp, metallic *tleet,* several times repeated, and in a trice vanished amid the bushes, saplings, and low palms of the underwood. I did not see the bird at the moment it took wing; but its line of flight had led from a low, moss-covered trunk, scarcely more than a hollow shell. On one side of the trunk the bark had broken away and hung loosely from above, leaving a wide gap that ended at about the level of the top of my head. I pushed into this gap the little mirror I always carry in my pocket for such contingencies, and it showed a cavity extending far down into the stump. I could see no sign of nest or eggs, but I clung to my impression that the bird had flown from the trunk.

Returning two hours later, I approached the stump slowly, keeping my eyes upon it, but making no effort to move silently. When I was still five or six yards distant, the head and foreparts of an ant-thrush were suddenly thrust out through a small gap in the hollow shell, beside the larger and more obvious one already mentioned. Clasping with its feet the opposite edges of the long, narrow aperture, the bird regarded me deliberately with large brown eyes, and rested there motionless, giving me an excellent opportunity to examine it through the field-glasses. Its crown was a dark, nondescript shade of brown; but its nape was bright rufous, and this color extended far down on the sides of the neck, forming a collar interrupted in front by the black throat. The brown eyes were surrounded by bare bluish skin. I moved a step forward, and the bird darted out and down, voicing its sharp *tleet tleet* call of alarm. I was elated by my discovery, the most exciting of the year.

The slightly leaning, hollow trunk was about 12 feet high and 7 inches thick. It was covered with green moss; a few aroids and small ferns were growing on it here and there. A stout woody vine which twined round it led up to the lower boughs of a neighboring tree. The central hollow was entered from above by the larger gap, facing south, which I had first noticed, whose lowest point was six feet two inches above the ground. Beside this and facing east was the smaller gap, which extended two inches lower.

I piled some logs at the base of the trunk and stood upon them for a more careful examination of the central hollow. The light beneath the trees was somewhat stronger now that the sun was higher; and in the mirror I could discern, or thought I could discern, two eggs lying very far below. To see them plainly, artificial illumination would be necessary. The same afternoon I brought an electric torch with a long cord and a bulb attached, which I hung in the hollow. Now I could clearly see the nest and eggs.

The two eggs rested approximately two feet below the entrance, or about four feet above the ground. They lay, as at the bottom of a well, upon a mat of dark brown material that filled the lower part of the deep, narrow cavity. They appeared to be white, very finely and

faintly stippled over the whole surface with brown, but it was impossible to make certain of these details from the reflected images of the distant, artificially illuminated eggs. The bottom of the cavity was so dark even at midday that they could be seen only very dimly in the mirror when the light was extinguished.

When I had completed my examination of the nest, I set up my brown wigwam before it in order to begin the study of the habits of the ant-thrushes the following morning (May 22). This is the record I made:

5:15 A.M. While the light is still dim in the forest, I enter the blind before the nest. As I go in I hear the sharp *tleet* alarm-call of an ant-thrush. Evidently it took fright and flew from the nest.

5:33. An ant-thrush silently flies up and enters the trunk through the small gap facing the east. It enters in one continuous motion, without the careful inspection of cavity and surroundings practiced by woodpeckers, trogons, and most other hole-nesting birds.

7:22. The mate, arriving silently from the north through the undergrowth, suddenly flies up and enters the trunk by the smaller gap. It is silent save for the whirring of its wings. Almost at once an ant-thrush (doubtless the one which has been incubating) appears in the small gap and stands facing outward in the opening, where a sunbeam, filtering through the forest canopy, falls full upon it. The bird calls, delivering an emphasized first whistle and about 10 following whistles; then it flies off to the south.

8:15. An ant-thrush suddenly enters exactly as at 7:22. Two minutes later a bird appears in the cavity behind the entrance and rests there, looking out. After a while, it descends below the doorway. Twice again an ant-thrush appears in the doorway, then descends—pausing for a time before the last descent. Finally an ant-thrush appears and stands in the large gap facing south.

8:28. It flies silently away.

11:27. This bird silently approaches, flies up and enters. An ant-thrush (the mate?) almost at once appears in the doorway, stands there a few moments looking around, then flies silently away. I now leave the blind and approach the nest; the other ant-thrush darts out and away, calling sharply: *tleet tleet tleet.*

Since the sexes of the ant-thrush are indistinguishable in appearance, it was not possible to determine exactly the part taken in incubation by male and female. But I think it a fair conclusion that at 7:22 and again at 11:27 nest-relief took place—that the bird that entered was not the one that immediately afterward emerged. It is not easy to

decide whether the ant-thrush that flew away at 8:28 was the same one that arrived at 8:15, or the mate. Since the bird that occupied the nest when the other came at 8:15 had been incubating for less than an hour, it is possible that it refused to make way for its mate, which then lingered in the top of the hollow awaiting the other's departure but finally grew tired and flew away. It is not unlikely, however, that the one that had been incubating did relinquish the eggs to the other but delayed its own departure, not yet feeling hungry.

The ant-thrushes' periods of sitting ranged from an hour and 49 minutes to 3 hours, or a little less. If there was no change-over at 8:15, then one bird sat continuously for 4 hours and 5 minutes; but we cannot be certain of this. Antbirds as a rule take long sessions on the eggs, male and female replacing each other infrequently. Even the smaller species often sit for two or three hours without interruption; and once I watched an Antpitta (*Grallaria perspicillata*) incubate for five hours without a break. At least in those species in which the sexes can be distinguished, the male usually takes somewhat longer sessions on the eggs by day than the female; but the female sits through the night. The ant-thrush coming to take its turn on the eggs always arrived silently, without signaling to its sitting mate. The outgoing partner usually flew off in silence, but once one of the birds called long and loudly from the doorway before flying out. When frightened from the nest by my approach, however, they almost invariably voiced sharp notes of alarm as they flew away. Their flight upon leaving the nest was strong, swift, and direct, gradually descending, reaching the ground a good distance from the hollow trunk.

I never attempted to remove the eggs for closer examination and measurement, for this would have been impossible without enlarging the gap in the side of the hollow trunk and placing the nest in jeopardy. From long experience in the tropical rain forest, I knew that this nest, cunningly concealed though it was, stood only a slight chance of escaping predators until the young were fledged; and I refrained from making any alteration that would decrease the probability of its success. But I came each day with light and mirror to see whether the eggs had hatched.

On May 27 the mirror revealed that the two eggs had hatched since the preceding day. The empty shells had already been removed. These were most surprising nestlings to find in an antbird's nest. All the other newly hatched antbirds I have seen—11 species in 7 genera —were as completely naked as newly hatched vireos, but these baby ant-thrushes were covered, on the upper parts at least, with long, dense down that seemed far more compact than that on most passerine nestlings, and by artificial light was dark gray. I inserted my arm into the cavity up to the shoulder, but the nestlings lay beyond my finger-tips.

Without enlarging the entrance, I would not be able to reach them; so I contented myself with examining them in the mirror. Viewed from above, they appeared as completely and as warmly clad with down as newly hatched rails; but when from time to time they squirmed about, they revealed glimpses of pink, naked skin on the neck and underparts. Most of the time they lay motionless, huddled into a single, dark gray, downy mass. But at intervals one would move, and the other make a swift answering movement to bring it once more into close contact with its nest mate.

I had hoped to watch the care and development of the young ant-thrushes; but their concealment, which to me seemed so excellent, was yet not sufficient to shield them from discovery by one of the many enemies of nesting birds that lurk in the tropical forest. Or perhaps on my visits I had left scents which led the sharp-nosed coatimundi or some other mammal to investigate the hollow stump. At all events, upon visiting the nest on May 30 I found the trunk torn open and the nestlings gone.

I tore out the side of the hollow shell to expose the ant-thrushes' nest. The bottom of the cavity was filled to a depth of about 14 inches with a loose mass of dead leaves of many kinds, chiefly dicotyledonous, but including some strips of palm fronds. The largest leaf measured 5 inches long by 3¼ inches broad. At the top, the leaves were mixed with slender dead petioles and flower stalks. Upon this filling rested the nest proper, a thick mat consisting largely of petioles and flower stalks, mixed with a number of long, slender, yellowish flowers, too far decayed for identification, and a few ventral scutes of a big snake.

Antbirds' nests are typically open, hemispherical structures, often suspended between the arms of a forked horizontal twig, vireo-wise. In none of the numerous open antbirds' nests that I have examined has there been any snakeskin. So too with wrens: house wrens (*Troglodytes* spp.) and Bewick's Wrens (*Thryomanes bewickii*), which breed in cavities, frequently place a bit of cast snakeskin in their nests; but the many wrens that build roofed nests in trees or bushes rarely if ever use this material. The Crested Flycatcher and other species of *Myiarchus* often take pieces of cast reptile skin into the cavities where they lay their eggs; but among the flycatchers that build nests in the open, the Arkansas Kingbird (*Tyrannus verticalis*) is exceptional in employing exuviae. The castle-builders (*Synallaxis* spp.) collect for their nests a great deal of the cast skins of both snakes and lizards; but although these birds do not nest in cavities, they construct relatively huge edifices of sticks in which they build the nest proper—much as a wren builds in a box provided for it. Thus reptile skins are quite commonly used by passerine birds that lay their eggs in cavities, very rarely by those that nest in the open. The theory has been advanced that birds place exuviae in their nests as scarecrows to ward off the attacks of predatory creatures, but I find it difficult to believe that a few ven-

tral scutes of a snake lying at the bottom of a dark cavity could be of service in frightening away any animal, however small. Yet the snake scales were not an integral part of the nest, and in view of their common use by hole-nesting species I believe that reptile skins, as such, must have some significance for the birds which is obscure to us.

I have published an account (Skutch, 1934) of the nesting of the Slaty Antshrike (*Thamnophilus punctatus*); subsequent studies, still in manuscript, of a number of other species and genera show that the open nest and naked young of this bird are fairly typical of the antbird family. Van Tyne (1944) found the hole-nesting habit described in only two genera of antbirds, *Gymnopithys* and *Formicarius*. Cherrie (1916) described a nest of *Formicarius colma* found on the Orinoco in March, 1899, which was in a natural cavity in a tree trunk and contained two pure white eggs. He also reported that *Formicarius analis saturatus* nests in holes in trees (Cherrie, 1908:366). Cleaves (1944) figures the nest, also a tree cavity, of *F. a. panamensis*.[2]

Thus *Formicarius analis* differs from the majority of other antbirds in its manner of reproduction as well as in its terrestrial habits. It nests in a cavity instead of in the open; and the young upon hatching are covered with down instead of being quite naked. It agrees with the more typical antbirds in laying two eggs (a number that appears to be as constant in this as in the hummingbird and manakin families) and in the participation of both sexes in incubation.

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[2] Carriker (1910) ascribed to *F.* [*analis*] *umbrosus* a frail open nest, containing a single egg that was dark greenish-olive, heavily blotched with different shades of burnt umber; but it would be most surprising if there really exists among closely related species such wide variation in nest and eggs.

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Finca 'Los Cusingos,' San Isidro del General, Costa Rica

GENERAL NOTES

The display of the Maned Goose.—In a recent paper, "The Family Anatidae" (*Wils. Bull.* 57, 1945:3–55), Ernst Mayr and I suggested (p. 31) that the Maned Goose (*Chenonetta jubata*—called "wood duck" in Australia) is closely related to the Carolina Wood Duck, *Aix sponsa*, and even more closely to the Mandarin, *Aix galericulata*. In habits and behavior, it resembles them nearly; and in pattern, the downy young is strikingly similar to that of *Aix galericulata*. In display, the relationship is also apparent, and I have recently been able to make further observations on this point. The New York Zoological Society possesses a single Maned Goose, an adult male. Since early March (1945—it is now May), he has been constantly displaying—both more elaborately and more persistently than is usually the case with a mated bird. His display on the water resembles very nearly that of a Mandarin drake, as described in "The Family Anatidae," page 30. He puffs out the feathers of his head and breast and holds his head back, pressing it down tightly among the interscapular feathers, completely hiding the neck; at intervals he slowly lowers his head toward the water, then throws it back quickly.

Either I had never seen the *Aix* type of display so well marked in *Chenonetta* (See p. 31 of "The Family Anatidae"), or the notes on the observation were lost when my files were destroyed by fire in 1939, and I therefore think it advisable to record this additional confirmation of the close relationship between *Chenonetta* and *Aix*.—Jean Delacour, *New York Zoological Society, Zoological Park, New York 60, N.Y.*

Crow killed by a Red-tailed Hawk.—On May 18, 1945, at 8:30 A.M., I noted an adult Red-tailed Hawk (*Buteo jamaicensis*) with a Crow (*Corvus brachyrhynchos*) in its talons. The hawk was perched in a tree near the Swan Creek Wildlife Experiment Station, Allegan County, Michigan; as I approached, the hawk relinquished its prey and flew off. I examined the crow and found it dead but still warm. There were numerous talon marks in the skin and flesh at the base of the skull and in the upper neck. Hawk predation on crows is apparently quite uncommon.—Philip Baumgras, *Swan Creek Wildlife Experiment Station, Allegan, Michigan.*

Some West Virginia breeding-season records.—The following records have accumulated during occasional field work in West Virginia since 1930. For information on the West Virginia status of several of the species treated here, I am indebted to Maurice Brooks.

Swainson's Warbler, *Limnothlypis swainsonii*. On July 2, 1944, George H. Breiding and I visited three Swainson's Warbler territories which John Handlan had found on the southwest edge of the city of Charleston, Kanawha County, West Virginia. Although including a small stream and an occasional rhododendron and mountain laurel, these territories, with second-growth deciduous trees, a few pines, and rather open clumps of mixed shrubs, saplings, and vines, are hardly to be compared with the dense streamside rhododendron thickets which make up the breeding territories of Swainson's Warbler in the Kentucky and West Virginia mountains. One of the three males was silent; the second sang regularly, but we could find neither female nor nest; the third sang occasionally but, during the 70 minutes of our observation, did not leave his favorite haunts to join a female which was caring for two juvenile birds (about five days out of the nest) a hundred yards up a steep slope. Two or three observers have reported fledglings in West Virginia, but no occupied nest has yet been found there.

Sycamore Warbler, *Dendroica dominica albilora.* I have spent considerable time searching for this species during the breeding season in the western counties of West Virginia, where it is decidedly rare. On May 28, 1939, I found a nest (with one egg and three newly hatched young) at a height of 30 feet in a small clump of sycamores along Mud River, about four miles east of Huntington, Cabell County. According to Maurice Brooks this is the first nest record of the Sycamore Warbler for West Virginia, although the state is included in the breeding range of the species in the 1931 A.O.U. Check-List. In 1937 and 1938 I found pairs in Wayne and Putnam counties. Others have recorded the species in Kanawha, Cabell, and Mason counties, extending its known range in West Virginia to five western counties. The eastern race (*Dendroica d. dominica*) has not yet been recorded for the state.

Sutton's Warbler, *Dendroica potomac.* On June 21, 1944, George H. Breiding and I discovered an adult male of this form along a stream 18 miles west of Martinsburg, Morgan County, in the eastern panhandle of West Virginia. This adds a new county to the distribution and a new type of habitat, since the territory occupied contained considerable hemlock along with a few scattered southern pines. We followed the bird for more than an hour at close range under good conditions for observation. The plumage details as figured by Sutton (*Cardinal,* 5, 1940:plate opp. p. 49) were clearly visible. It sang almost continuously, sometimes the "double" Parula song as described by Haller (*Cardinal,* 5, 1940:49), at others, the normal Parula song with a "freak" ending—stopping suddenly with a soft insect-like note which suggested that the bird had been "submerged" or had suffered muscular collapse. No mate was observed; in fact, we gathered the impression that we were watching an unmated bird. Its territory was about 800 by 300 feet, lying on either side of a stream and including steep banks and numerous "singing trees." Other warblers in song near by included a Blackburnian, a Magnolia, a Worm-eating Warbler, and several Redstarts and Parulas. This is the fourth known record of this warbler. In addition to the two specimens taken by Haller in Berkeley and Jefferson counties, a third bird was observed by Bayard H. Christy and Maurice Brooks (*Cardinal,* 5, 1942:187-189).

Dickcissel, *Spiza americana.* The A.O.U. Check-List records the Dickcissel as "extremely rare and irregular east of the Alleghenies." On June 22, 1944, George H. Breiding and I collected a singing male (with enlarged testes) two miles southwest of Kearneysville, Jefferson County, in the eastern panhandle. We did not look for a nest, but the Dickcissel was obviously nesting in a small field of mixed alfalfa and timothy. The specimen was given to the museum of West Virginia University. This record is the first for West Virginia east of the mountains. Summer records elsewhere in West Virginia are as follows: (1) two birds in Wyoshur County in 1914 (A. B. Brooks); (2) two pairs in May and June, 191 , ear Bethany, Brooke County (Sutton, *Cardinal,* 3, 1933:121); (3) one bird ear Cranesville, Preston County, June 3, 1936 (Ruth and Maurice Brooks); (4) a colony in Mason County during the summer of 1938 (Karl Haller).

Henslow's Sparrow, *Passerherbulus henslowi.* On July 7, 1935, I obtained the first record of this species for West Virginia, a breeding male (western race) taken in Mason County (*Wilson Bulletin,* 50, 1938:291). The eastern race has since been found to be quite common in eastern West Virginia. Both races have increased phenomenally during the last 10 years, and they now occur regularly in many localities. Since 1938 I have found them in some numbers in a dozen scattered counties and discovered two nests in Preston County. Two singing males seen June 13, 1944, at Tomlinson Run State Park, Hancock County, are among the first records for the northern panhandle. To date, the population build-up in West Virginia parallels that in Ohio, though occurring 20 years later. In Ohio this bird made the transition from rarity to extreme abundance in less than 20 years.

Eastern Lark Sparrow, *Chondestes grammacus grammacus*. On June 22, 1944, I discovered an adult, followed by two recently fledged young, on a dry limestone-studded slope west of the Potomac River and six miles north of Shepherdstown, Jefferson County. Breeding records of this species east of the mountains are rather rare.—LAWRENCE E. HICKS, *Ohio State University, Columbus, Ohio.*

Bird remains from an Indian village site in Ohio.—In 1917 Mills ("Certain Mounds and Village Sites in Ohio," Vol. 3, Pt. 1, p. 46) reported six species of birds from the Feurt Village Site which is located about five miles north of Portsmouth in Clay Township, Scioto County, Ohio, just east of the Scioto River. From 1937 to 1942, excavations for archaeological specimens were carried on at this site by Dr. Stanley Copeland, H. R. McPherson, and Philip Kientz, of Columbus, Ohio, who generously allowed me to study the animal remains that they recovered there. The material is presumed to date from the fifteenth or the sixteenth century.

From among the remains 646 bird bones were identified; 439 are from the Turkey, but altogether, at least 30 species of birds are represented. Eight of these have been reported by Alexander Wetmore (1943, *Wils. Bull.*, 55:55 and 127) to whom I am indebted for assistance in identifying most of the bones. The complete list of birds now known from the site is as follows:

Common Loon
Gavia immer
Pied-billed Grebe
Podilymbus podiceps
Great Blue Heron
Ardea herodias
Trumpeter Swan
Cygnus buccinator
Canada Goose
Branta canadensis
Blue or Snow Goose
Chen sp.
Mallard
Anas platyrhynchos
Black Duck
Anas rubripes
Blue-winged Teal
Anas discors
Wood Duck
Aix sponsa
Ring-necked Duck
Nyroca collaris
Lesser Scaup Duck
Nyroca affinis
Red-tailed Hawk
Buteo jamaicensis
Red-shouldered Hawk
Buteo lineatus
Bald Eagle
Haliaeetus leucocephalus
Marsh Hawk
Circus cyaneus hudsonius
Ruffed Grouse
Bonasa umbellus
Prairie Chicken
Tympanuchus cupido
Bob-white
Colinus virginianus
Turkey
Meleagris gallopavo
Little Brown Crane
Grus canadensis canadensis
Sandhill Crane
Grus canadensis tabida
Woodcock
Philohela minor
Passenger Pigeon
Ectopistes migratorius
Great Horned Owl
Bubo virginianus
Barred Owl
Strix varia
Flicker
Colaptes auratus
Pileated Woodpecker
Ceophloeus pileatus
Ivory-billed Woodpecker
Campephilus principalis
Raven
Corvus corax
Crow
Corvus brachyrhynchos.

—ROBERT GOSLIN, *Department of Physiology, Ohio State University, Columbus, Ohio.*

The formation of pellets by the Barred Owl.—An adult female Barred Owl (*Strix varia*) from Tulsa, Oklahoma, was used in the following investigation of pellet formation, which was made in 1939 in the University of Michigan Laboratory of Vertebrate Biology at the suggestion of the Director, Lee R. Dice.

Deer mice (*Peromyscus*) were supplied to the owl as its only food, always in numbers exceeding its maximum nightly consumption. The pellets regurgitated by the owl were collected each day, stored, and examined later to determine the number of mice in each pellet. The number of pairs of mandibles each pellet contained was used as an index to the number of mice that went into its formation, since the mandibles are especially resistant to digestion and are easily identified. It was assumed that the parts of a mouse were not dissociated in digestion; that is, when both mandibles were present in any pellet, it was assumed that the remains of the whole mouse were there. Careful examination of all the bones in a number of pellets showed that this assumption was justified in general, though it could not be proved in every case, and it is possible that there was a certain amount of dissociation.

The owl ate 149 mice (all adult, or of near adult-size) between January 7 and March 25, an average of 1.9 mice per night. Of these, 148 mice, or 99.3 per cent, were counted in the pellets, which varied in size as follows: 68 pellets were small, and each contained the remains of a single mouse (46 per cent of the total mice consumed); 28 medium-sized pellets contained the remains of two mice each (38 per cent of the total mice); 8 pellets of large size carried the remains of three mice each (16 per cent of the mice). Pellets were always regurgitated within eight hours after a meal. Pellet size was apparently not determined by the number of mice taken at a feeding: the owl was occasionally observed in pellet regurgitation, and several times two or three small pellets, each containing the remains of a single mouse, were expelled at brief intervals.

When first regurgitated, a pellet is a solid, moist mass of closely packed hair and skeletal remains, held firmly together by a mucilaginous secretion. The pellets harden as they dry and are, for a time, quite resistant to dissection. They come apart easily if soaked in water; kept in dry storage, they disintegrate within a year.

In order to determine whether hair is essential as a binder for pellets, the owl was fed deer mice of a hairless strain for four consecutive nights. Pellets regurgitated after these feedings varied in size and content just as "normal" pellets did. Although less firm than the hair-containing pellets, they were cemented by the same thick mucilaginous substance which became firm on drying, and they retained their distinctive shape throughout regurgitation, the drop from perch to floor, and later handling by the investigator—demonstrating that neither the formation of pellets nor the retention of their characteristic form requires the presence of hair. —E. Carl Sensenig, *Department of Anatomy, Tulane University, New Orleans.*

Cape May Warblers capturing flying insects.—From May 8 to 14, 1944, I observed five male and three female Cape May Warblers (*Dendroica tigrina*) about my orchard in Findlay, Hancock County, Ohio. The warblers fed for the most part in the topmost branches of the trees, but occasionally one of them, always a male, would descend to a wire cable that was stretched at a height of three feet between two posts of the grape arbor. The bird would remain there for 15 or 20 minutes at a time, half walking, half fluttering, back and forth on the wire while weaving from side to side, craning its neck, and snapping its beak. Sitting 15 feet away from the wire and using my binoculars, I determined the purpose of this peculiar behavior: the bird was catching the tiny insects that moved to and fro in pale wavering clouds in the shade of the trees. An insect was captured, on the average, every five seconds. The misses were few, averaging one in every 15 attempts. One bird, for example, caught 156 insects in 12 minutes. The insects were fruit flies (*Drosophila melanogaster*) and a species of midge.—Richard Stuart Phillips, *Findlay, Ohio.*

EDITORIAL

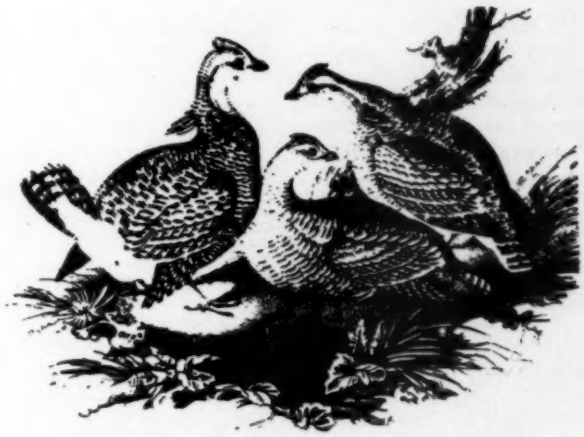
Peter Rindisbacher's portrait of the Dowitcher which, as a result of one of A. W. Schorger's valuable historical studies, appears as the frontispiece of this number of the *Bulletin,* is of especial interest because it is one of the earliest portraits of the species. It is, in fact, the earliest picture we have seen of the fall plumage, which is so very different from the ruddy-breasted spring dress. It was, of course, the fall plumage that Thomas Pennant described in 1785, from Mrs. Blackburn's collection of New York birds, as the "Brown Snipe"; he described the spring plumage elsewhere in the book as the "Red-breasted Snipe." Pennant did not give the bird a Latin name, but Gmelin, in his 1788 edition of Linnaeus, cited Pennant's description of the "Brown Snipe" and gave the bird the name *griseus* that we now use.

In 1813 Wilson remarked the Dowitcher's similarity to the common (Wilson's) snipe in "general form, size, and colors"—an observation fully confirmed by Percy Lowe in 1931 after a detailed study of the anatomy.

Mr. Schorger sent us some very interesting photostat negatives made from the "Wilson's Pinnated Grouse" and "Grouse" portraits mentioned in his paper. Unfortunately it was not possible to include these as illustrations of the article, but we hope that, in spite of unavoidable loss of detail, the copy shown below of the Prairie Chicken portrait will convey some impression of Rindisbacher's published work. This portrait is of particular interest because it was engraved for the *American Turf Register and Sporting Magazine* by Alexander Lawson, the great Philadelphia engraver, who is now best known for his part in the publication of Wilson's "Ornithology."

It might well repay an ornithological student to investigate the pages of the *American Turf Register* (published from 1829 to 1844). B.L.H. [Bertha L. Heilbron] states in *Minnesota History* (vol. 14, 1933:423) that the *Register* "from time to time reprinted extracts from the published works of . . . . Audubon and other writers on the West." Complete files of this once popular magazine are now, of course, extremely rare.

We are very grateful to Mr. Schorger for the opportunity to publish a contribution to the history of ornithology that offers so many facets of interest.



From "Wilson's Pinnated Grouse" by P. Rindisbacher

Since war time regulations again prevent our holding a regular Annual Meeting, President Kendeigh has asked the Council and the Chairmen of standing committees to meet August 20 at Jackson Mill, West Virginia, to carry on the necessary business of the Club. He asks that members write to the Secretary about any business which they would like to have brought up at the meeting.

Generous support of the Club through difficult years has enabled us to continue the subscriptions of members prevented by war conditions from paying their dues. We were very happy to receive a letter recently from an English member who had finally obtained a permit and was sending dues for 1942 through 1945. "It was pleasant when coming home on leave," he says, "to find Wilson Bulletins awaiting me. . . . Kind regards and all good wishes to the W.O.C."

The Wilson Ornithological Club Library is enjoying a steady increase in size and in use. In spite of the undoubted decrease in ornithological research caused by the war, more requests have come to the Library in the past few months than ever before. Added experience in administering the Library has demonstrated very clearly the value of the reprint collection. From that collection the librarian is often able to supply the needs of a borrower by sending several small reprints from periodicals, thus saving the bird student considerable postage expense and keeping the bound volumes available for other workers. We therefore urge members to send in to the Library as complete a set of their reprints as possible—including reprints from even the most generally available publications.

There is another easily overlooked need of the Library, namely, the need for recently published books on ornithology and related subjects. The Club has no funds for the purchase of new books, and yet many of the calls that come to the librarian are for the latest publications. Perhaps the need could largely be met by our members sending in recent books which they have read and do not need for reference in their libraries. We are sure that some members, when they know of this problem, will want to send to the Library copies of recent books which they especially admire and would like to have other members read.

We should be glad of the members' assistance in compiling the Bibliography section of the *Bulletin*. When you have read an article dealing with birds or related subjects—particularly when it appears in a non-ornithological journal—which you think should be called to the attention of the other members of the Club, please send the title, with complete reference (preferably in the form used in the Bibliography), to the Editor. A brief statement of the contents of the article would be doubly helpful. It is perhaps not necessary to remind our readers that such articles (or reprints of them) would be a valuable addition to the Wilson Ornithological Club Library.

Ornithological News

Mr. John H. Baker, President of the National Audubon Society, has been good enough to give us some details of a cooperative project for investigating the status of the Whooping Crane. The Society and the Fish and Wildlife Service have agreed to jointly sponsor field investigation and research on the numbers, breeding localities, and life history of this crane in order to determine what steps may reasonably be

taken toward further protection and restoration of the species. The Society has undertaken to finance the first year's expenses of the project, and a final report will be published as one of the series of Audubon Research Reports.

Mr. C. L. Broley of Winnipeg, Manitoba, has organized sources of information on this year's nesting Whooping Cranes in western Canada and assured the cooperation of the Mounted Police, the airlines, Hudson's Bay Company, Radio Station CBC in Winnipeg, and Ducks Unlimited, as well as that of several publications and Provincial Departments. Mr. Fred G. Bard, Curator of the Provincial Museum of the Department of Reconstruction and Rehabilitation at Regina, Saskatchewan, has been engaged as field investigator for the nesting season of 1945. The U. S. Army Air Force will cooperate by providing planes and crews to aid in making field surveys. Our First Vice-President, Dr. Olin Sewall Pettingill, Jr., has been engaged as Audubon Research Fellow on the project, beginning September 15, 1945; he has been granted leave of absence by Carleton College for the duration of the investigation.

Further details on the project will be published in the May-June number of the *Audubon Magazine*.

Houghton Mifflin have reissued Roger Tory Peterson's "A Field Guide to the Birds," which has been out of print for some time.

It has been announced that James L. Peters, Curator of Birds at the Museum of Comparative Zoology, has been elected Vice-President of the International Commission on Zoological Nomenclature, to succeed the late Dr. C. W. Stiles of the Smithsonian Institution.

Aldo Leopold has an interesting note on administration *versus* research in the *Wartime Newsletter* (Feb. 1, 1945, page 3) of the Wildlife Society. He reports that the Wisconsin Conservation Department plans to "protect . . . the technical initiative" of those men now needed in administrative positions whose work has previously been chiefly in research, by guaranteeing them a "certain proportion of their time for the continuance of research" and giving them the "necessary assistance to make this guarantee feasible of execution."

NEW LIFE MEMBER

MAURICE GRAHAM BROOKS, member of the Wilson Ornithological Club since 1926 and Secretary since 1941, received the A.B. and M.S. degrees from the West Virginia University and is now Associate Professor of Wildlife Management there. He is a Member of the American Ornithologists' Union and represents our organization on its Council. As editor of the *Redstart* and Chairman of the West Virginia Biological Survey, he is taking an important part in the investigation of his special field of interest—the ecology of the birds and plants of the Appalachian Mountains.

WILDLIFE CONSERVATION

Crop Protection without Wildlife Destruction

Margaret M. Nice has recently called our attention to the development of a device to frighten wild ducks from grain fields. Recurrent serious damage to corn and grain in the Platte River Valley in Colorado and Nebraska, to wheat and barley in the Dakotas, and rice in California and Texas, has necessitated control measures such as, for example, the lengthened duck-hunting season and liberalized bag-limit of 1944.

The new device, developed by the Fish and Wildlife Service's Research Laboratory at Denver, employs an electric beacon so regulated that it rotates a beam of light over the area to be protected. A standard automobile spotlight, with clear glass lens and 50-candlepower bulb, is used as the source of light. Rotation power is furnished by a 6-volt phonograph motor operated from a storage battery or by another type of motor operating on 115-volt alternating current.

Three leaflets issued by the Fish and Wildlife Service (BS-13, August 1935; BS-149, November 1939; Wildlife Leaflet 256, June 1944) describe the mechanism in detail and discuss the results of its use. As a means of minimizing crop damage by wildlife, this seems far more satisfactory than the customary "shoot," the use of poison, or the establishment of bounties.—C.A.D.

Protection for Hawks and Owls in Minnesota

In 1903, the Minnesota Legislature adopted the A.O.U "model law" for the protection of non-game birds (including most of the hawks and owls); in 1925, this act was rescinded, and legal protection was withdrawn from all hawks and owls. Efforts were then made from time to time to persuade the Legislature to restore protection but were thwarted by a few groups actively supporting an all-embracing "vermin control." This year, however, the Minnesota Ornithologists' Union organized a Bird Protection Committee, with W. J. Breckenridge as chairman, which, supported by the Minnesota Conservation Federation, asked the Legislature to provide protection for most species of hawks and owls. As a result, the new Minnesota game and fish code protects all hawks and owls except the Goshawk, Cooper's Hawk, the Sharp-shinned Hawk, and the Great Horned Owl. —Gustav Swanson.

Revival of the Bounty Question

The present high population of red and gray foxes (*Vulpes fulva* and *Urocyon cinereoargenteus*) in the north-central and eastern states has resulted in renewed demands from farmers and sportsmen that fox bounties be established or—where they are already in effect—increased.

Apparently in an effort to ward off unwise pressure for a fox bounty, the state conservation departments of New York and Michigan have recently prepared for distribution popular bulletins dealing with the fox problem. The Conservation Department of Ohio, which has a fox-bounty law already before its legislature, is contemplating a similar publication. The New York bulletin, "The Fox in New York," by Clayton B. Seagears is a well-illustrated and carefully documented report on the life history, abundance, economic importance, and management of both red and gray foxes in that state. The demand for this publication quickly exhausted the first edition, and a second edition is now planned to meet more than 3,000 unfilled requests. The Michigan publication, "The Red Fox, Friend or Foe," by Donald W. Douglass and G. W. Bradt, is also well written and contains a candid discussion of the bounty system.

The current issue of the Wisconsin Conservation Bulletin (Vol. 10, No. 4) carries a discussion of the fox problem in an article, "Deer, Wolves, Foxes and Pheasants," by Aldo Leopold.—C.A.D.

WILDLIFE CONSERVATION COMMITTEE
Charles A. Dambach, *Chairman*

ORNITHOLOGICAL LITERATURE

MODERN BIRD STUDY. By Ludlow Griscom. Harvard University Press, Cambridge, Mass., 1945: 5⅛ × 7½ in., x + 190 pp., 15 photos, 10 maps and diagrams. $2.50.

"Modern Bird Study" is a fine little book, and I have read it with the greatest interest from cover to cover. It is not simply about birds; it is not simply another "What bird is that?" book; it is about avian populations and all that the words imply: the adaptability of bird populations, their migrations, the routes that they take during their travels, and their distribution. The first five chapters—Development of Field Ornithology. Capacity and Intelligence of Birds. Adaptability of Birds. Migration: Causes and Origin. Migration: Factors and Routes—"will appeal to any layman with a general interest in birds," as Griscom says in his preface; "The chapters on distribution and classification are more technical. . . . The main object of the book . . . is to show that the study of birds is not only a branch of scientific research . . . but that it also contains many topics of interest to the layman, and that the growing army of bird watchers have and can really assist the ornithologist in solving problem after problem by controlled, careful, and thorough observation."

It is a delightfully made little book, too. It fits into the pocket, and I can think of nothing better to lighten a tiresome train journey. There are 15 unusual photographs by Cruickshank, A. A. Allen, Edith Sloan Griscom, and others, as well as 10 very helpful maps and diagrams. Useful references are given at the end of each chapter, and there is an adequate index. At first sight the text may seem short, but it is as packed with meat as the proverbial nut.

Of course, it is the part concerning distribution that interests me most, and the analysis here is really first rate. I was extremely interested to find that Griscom is much more sympathetic to J. A. Allen's postulates concerning North American geographical distribution than to C. H. Merriam's. In the chapter on classification, there is an excellent analysis of the question of superspecies and incipient species, as well as a clear, brief, easily understood discussion of sympatric and allopatric species; monotypic and polytypic species; and intergradation.

This is a hard book to review because I am tempted to give long quotations from it—which simply reiterates what I said before: it is a meaty little book. (At first sight I may seem biased because Ludlow Griscom is here at the Museum of Comparative Zoology, but I think probably it would be truer to say that I am hypercritical because the book is distinctly "up my alley.")—T. Barbour.

CHECK-LIST OF BIRDS OF THE WEST INDIES. 2nd ed. By James Bond. Academy of Natural Sciences of Philadelphia, 1945: 6 × 9 in., xiii + 182 pp., map. $2.00.

At first glance the second edition of Bond's Check-List seems not to differ greatly from the original edition (1940) that was reviewed in this journal, vol. 53, p. 40, but a careful comparison of the two reveals numerous changes. In the first place, the preface has been enlarged and the lists of extinct and vanishing species revised; to the extinct birds is added *Columba inornata wetmorei* which has not been found since 1926; on the other hand, the number of birds that Bond believes may become extinct within the next hundred years has been reduced from thirteen to six. The list of rare or local forms has been omitted entirely.

A few species, reports of whose occurrence in the West Indies are now considered doubtful, have been dropped from the Check-List, and a few recent records (e.g. *Dendrocygna bicolor* from Cuba) added. A new feature is the inclusion

of the earliest dates of arrival and the latest dates of departure of the North American migrants. In the original edition, free use was made of footnotes to explain the author's views on relationships and derivations; in the second, this practice is amplified. It is interesting to note in the present edition that Bond has carried out certain changes which he tentatively proposed in the earlier edition; for instance, he unites *Nesophlox* with the Central American *Calliphlox*, places *"Calypte" helenae* in *Mellisuga*, reduces the status of *Colaptes chrysocaulosus* to a race of *C. auratus*, and unites *Holoquiscalus* with *Quiscalus*. There can certainly be no serious objection to any of these proposals. On the nomenclatural side we find *Parula* replacing *Compsothlypis* (and the family called Parulidae) and *Spermophila* replacing *Sporophila*, since under the international code they are not preoccupied by *Parulus* and *Spermophilus* respectively.

This check-list is the culmination of many years of devotion to the ornithology of the West Indies, both in the field and in the museum; it will stand as authoritative for a long time to come.—J. L. Peters.

ATLAS OF AVIAN ANATOMY: OSTEOLOGY, ARTHROLOGY, MYOLOGY. By Frank Wilbut Chamberlain. Michigan Agricultural Experiment Station Memoir Bulletin 5, 1943 [1944]: 47 pp. of text, 95 pls. $2:50.

Because the title of this book might prove misleading to some ornithologists, it seems advisable to mention briefly some of its inadequacies. It was prepared primarily for use in veterinary medicine and deals only with domestic types, such as chickens, geese, swans, and their close relatives. It is not, then, a general atlas, and it is in no true sense comparative. Its descriptions and terminology are not correlated with the recent anatomical work by Howell (*Auk*, 54, 1937:364–375; 55, 1938:71–81), nor with the muscular anatomy by Hudson (*Amer. Midl. Nat.*, 18, 1937:1–108), with its superior illustrations. Indeed, these and many other significant papers, for example, those of Gadow and Fürbringer, are not listed in the one-page bibliography. The plates showing bones could have been distinctly useful if more than a smattering of the topographical features had been labelled. These drawings do indicate the kind of bird involved, but unfortunately the illustrations of joints and muscles do not. These defects may not be of consequence when the work is used in vocational training, but the general zoologist can view only with regret the failure of the veterinary anatomist to correlate his work with that in broader fields.—Alden H. Miller.

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"Age Groups and Longevity in the American Robin"—a Correction

Footnote 7, page 71 of the March (1945) *Wilson Bulletin* should read: "Nice (personal communication) estimated an average of 4.4 young per pair per season for *Turdus migratorius achrusterus* in Oklahoma."—Donald S. Farner.

REPORT OF THE SECRETARY FOR 1944

The Wilson Ornithological Club continued to prosper in 1944, despite interruptions resulting from the war. We closed our year (as of December 1) with 1,084 members on our rolls, a net increase of 56 over the membership in 1943. During 1944, we lost from all causes 95 members and received 151 new ones, including a number of former members who had dropped out during the last few years.

Our membership by classes is now distributed as follows: 3 Founders, 24 Life Members (an increase for the year of 5), 58 Sustaining Members (an increase of 13), 385 Active Members (an increase of 51), and 614 Associate Members (a decrease of 13).

The Membership Committee, with Frederick M. Baumgartner as Chairman, and also the officers and members of the Club, have been diligent in searching out new members. Special mention should be made of George O. Hendrickson whose recommendations secured 42 new members in 1944! Richard L. Weaver secured 8 new members; J. J. Hickey and George M. Sutton, 7 each; W. J. Breckenridge and Harold D. Mitchell, 5 each; Clark S. Beardslee and I. B. Boggs, 4 each; Frank J. Hinds, Linus C. Hoffmeister, Howard L. Mendall, Edwin T. Moul, and Frank A. Pitelka, 3 each; A. F. Ganier, Lawrence I. Grinnell, H. W. Hann, S. C. Harriot, and Gordon Wilson, two each; Bernard William Baker, Mrs. F. L. Battell, Howard Elmer Bishop, L. Irby Davis, John T. Emlen, Jr., William G. Fargo, S. B. Heckler, Harold M. Hefley, Dorothy Hobson, George T. Hughes, David W. Johnston, E. J. Koestner, Harry A. McGraw, Howard H. Michaud, Levi L. Mohler, Gale Monson, Roger Tory Peterson, Charles L. Remington, Thomas J. Scott, Wayne Short, Gerald B. Spawn, Doris Huestis Speirs, J. Murray Speirs, Gustav Swanson, Ruth D. Turner, Frank G. Watson, and Harold B. Wood, one each. The nomination blanks included with the annual dues notices have added an encouraging number of prospective members to our list.

The mail ballot for officers of the Club during 1945 resulted in the election of the slate suggested by the Nominating Committee, namely:

President: S. Charles Kendeigh
First Vice-President: Olin Sewall Pettingill, Jr.
Second Vice-President: Harrison F. Lewis
Secretary: Maurice Brooks
Treasurer: Milton B. Trautman
Councillors: Burt L. Monroe, Eugene P. Odum, Lawrence H. Walkinshaw

Josselyn Van Tyne was re-elected Editor at the meeting of the Council in August.

The Secretary wishes to express the thanks of the Club to the many persons whose efforts have forwarded the work of the organization during these difficult times.

Respectfully submitted,
MAURICE BROOKS, *Secretary*

December 1, 1945

WILSON ORNITHOLOGICAL CLUB LIBRARY

The following gifts have been recently received. From:
G. Reeves Butchart—1 book
Leon Kelso—1 pamphlet
William H. Phelps—4 reprints
Katie Roads—2 books, 2 pamphlets
Wendell Taber—1 book
Josselyn Van Tyne—43 reprints
James B. Young—1 reprint

TO THE MEMBERS OF THE WILSON ORNITHOLOGICAL CLUB:

The prosecution of the war and the establishment of a sound peace are the vital concern of us all, and it is proper that a great part of the individual attention and effort of each of us should at present be devoted to them.

Nevertheless, other interests—the normal, cultural interests of times of peace—have still a rightful claim to our attention, since it is in fact for just such things that we are fighting. Not only may we rightfully support these interests, even in the midst of war, and even though they do not directly aid the war effort, but we may look ahead and plan for their further development after the war.

One such peacetime interest important to the members of the Wilson Club is the advancement of ornithology and related sciences, particularly by furthering the work of the Club in its special field. There is no need to impress upon you the value of the work of the Club. You have shown your belief in it by becoming members, by actively supporting the Club year after year, and frequently by raising your membership status. You know that the Club is doing fine work—now evidenced primarily by the publication of the *Bulletin* and its growing list of subscribers but also by other activities less well known but equally worthy of encouragement. The continued advancement of the Club's work and the extension of its field of usefulness can be achieved only through the continued and increasing support of its members and friends.

Your support may be given in various ways: through changing from one class of membership to a higher one, especially to that of Life Membership, and through gifts or bequests. By arranging with your attorney for a bequest, those of you who are greatly interested in promoting the work of the Club, though not now in a position to render substantial aid, may provide such aid for the future. But a Life Membership will undoubtedly appeal to a number of you. It requires payment of one hundred dollars, which may be made, if you prefer, in four equal annual installments. Gifts and bequests (unless the donor specifies otherwise), as well as Life Membership payments, are placed in the endowment fund, whose principal always remains untouched and is invested to produce a safe income—at present, of course, in War Bonds as the Club's collective contribution to the war effort.

The Committee extends to each of you the thanks of the Club as a whole for your cooperation in the past and solicits your continued support in the future.

Respectfully yours,

THE ENDOWMENT COMMITTEE
George B. Thorp, *Chairman*

1400 Lake Shore Drive
Chicago 10, Illinois
June 1, 1945

REPORT OF THE COMMITTEE ON AFFILIATED SOCIETIES

At the August 1944 meeting of the Wilson Ornithological Club Council, a change in the membership of the Affiliated Societies Committee was approved. In future it will consist of a chairman appointed by the President of the Wilson Club, a member-at-large for the Wilson Club, and one representative from each of the affiliated societies. Formation of the new committee is now complete, and membership is as follows: *Chairman,* Gordon M. Meade; *Member-at-large,* George Lowery; *Representatives,* Eugene P. Odum (Georgia Ornithological Society), O. A. Stevens (Inland Bird Banding Association), Harvey B. Lovell, (Kentucky Ornithological Society), Amelia R. Laskey (Tennessee Ornithological Society), J. J. Murray (Virginia Society of Ornithology), N. R. Barger (Wisconsin Ornithological Society).

The affiliated groups will work through this committee to promote closer affiliation and exchange of ideas.

May 3, 1945 GORDON M. MEADE, M.D., *Chairman*

TO OUR CONTRIBUTORS

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